ELEVENTH REPORT

(Seven annual, four biennial)

OF THE

BOARD OF TRUSTEES

OF THE

ILLINOIS INDUSTRIAL UNIVERSITY,

URBANA, CHAMPAIGN COUNTY, ILLINOIS,

For the Two Years ending September 30th, 1882.

SPRINGFIELD, ILL.:
H. W. ROKKER, STATE PRINTER AND BINDER.
1882.

Studies serve for delight, for ornament and for ability. Their chief use, for delight is in privateness and retiring; for ornament, is in discourse; and for ability, is in the judgment and disposition of business;—for expert men can execute, and perhaps judge of particulars, one by one; but the general counsels and the plots and marshalling of affairs come best from those that are learned.—LORD BACON.

The grand result of schooling is a mind with just vision to discern, with free force to do; the grand schoolmaster is Practice. * * * He that has done nothing has known nothing. Vain is it to sit scheming and plausibly discoursing; up and be doing! If thy knowledge be real, put it forth from thee; grapple with real Nature; try thy theories there and see how they hold out.—CARLYLE.

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CONTENTS.

FACULTY.

SELIM H. PEABODY, PH. D., LL. D.,
Regent, and Professor of Mechanical Engineering and Physics.

THOMAS J. BURRILL, M. A., PH. D.,
Professor of Botany and Horticulture, and Vice-President.

SAMUEL W. SHATTUCK, M. A., C. E.,
Professor of Mathematics.

EDWARD SNYDER, M. A.,
Professor of Modern Languages.

DON CARLOS TAFT, M. A.,
Professor of Geology and Zoology.

JOSEPH C. PICKARD, M. A.,
Professor of English Language and Literature.

N. CLIFFORD RICKER, M. ARCH.,
Professor of Architecture.

JAMES D. CRAWFORD, M. A.,
Professor of History and Ancient Languages, and Secretary.

HENRY A. WEBER, PH. D.,
Professor of Chemistry.

GEORGE E. MORROW, M. A.,
Professor of Agriculture.

FREDERICK W. PRENTICE, M. D.,
Professor of Veterinary Science and Physiology.

PETER ROOS,
Professor of Industrial Art and Designing.

WILLIAM T. WOOD,
SECOND LIEUT. 18TH INFANTRY, U. S. A.,
Professor of Military Science and Tactics.

IRA O. BAKER, C. E.,
Professor of Civil Engineering.

MELVILLE A. SCOVELL, M. S.,
Professor of Agricultural Chemistry.

CECIL H. PEABODY, B. S.,
Assistant Professor of Mechanical Engineering.

CHARLES E. PICKARD, B. A.,
Assistant in English and Ancient Languages.

EDWIN A. KIMBALL,
Foreman of Machine Shop.

NELSON S. SPENCER,
Foreman of Carpenter Shop.

JEROME SONDERICKER, B. S.,
Instructor in Right Line Drawing.

J. C. FEITSHANS, M. A.,
Instructor in Elocution.

CHARLES J. ROLFE, M. S.,
Instructor of Mathematics and Botany.

JAMES E. ARMSTRONG, B. S.,
Instructor in Natural Science, and Taxidermist.

MRS. ABBIE WILKINSON,
Teacher of Vocal and Instrumental Music.

CHARLES C. BARNES,
First Assistant in Chemical Laboratory.

HOWARD SLAUSON,
Second Assistant in Chemical Laboratory.

LIST OF GRADUATES.

Those whose names are prefixed by a * died at the date mentioned. Graduates who have the rank as Captain have received commissions from the Governor of the State as Captain in the Illinois National Guard.

1872.

Name.	Occupation.	Residence.
Burwash, Milo B	Farmer	Champaign
Davis, John J., B. S	Physician	Racine, Wis
Drewry, Henry N	Physician	Altamont
Flagg, Alfred M. Captain	Lawyer	Sioux Falls, Dak.
Hatch, Miles F	Lumberman	New Lacoma, W. T.
Hill, Edgar L., Captain	Farmer	Watson
Lyman, George H	Civil Engineer	Cairo, Ill
Matthews, James N	Physician	Mason
Reiss, Willis A	Teacher	Belleville
Reynolds, S. A., Captain	Lawyer	Chicago
Ricard, Thomas E., Captain	Farmer	*Springfield
Ricker, N. Clifford, M. Arch, Professor of Architecture, Illinois Industrial University		Champaign
Rolf, Charles W., M. S., Instructor Mathematics and Botany, Illinois Industrial University		Champaign
Silver, Howard, Principal Public Schools		Hutchison, Kan.
Silver, Charles W., County Supt. of Schools		Newton, Kan
Teeple, Jared	Merchant	Marengo
Wharton, Jacob N	Machinist	Bement
Whitcomb, Alonzo L	Physician	Tolono
Wood, Reuben O., Captain	Farmer	Woodburn

1873.

Name,	Occupation.	Residence.
Graham, Charles P	Clergyman	New Salem, Kansas.
Hatch, Frederick L	Farmer	Blivins Mills
Hayes, Charles I., B. S., Super't. Mining Works		Argentine
Hennessey, Augustus L	Editor	Chicago
Hook, Samuel H	Miner	Black Hills, Col.
Morrow, Andrew T	Farmer	Touganoxie, Kan.
Ockerson, John A., B. S., Engineer U. S. Lake and River Survey		St. Louis, Mo
Phillips, Parley A	Farmer	Damascus
Platt, Franklin C. Capt	Lawyer	Don City, Iowa
Porterfield, Elijah N	Civil Engineer	Eureka Springs, Ark.
Robbins, Henry E., Principal Public Schools	Teacher	Lyons, Iowa
Swartz, Alexander C., C. E	Farmer	Beulah, Kan.
Williams, Lewis E	Farmer	Montrose, Iowa

1874.

Name.	Occupation.	Residence.
Baker, Ira O., C. E., Professor of Civil Engineering, Illinois Industrial University		Champaign
Campbell, John P.	Druggist	Enfield
Drewry, Ebenezer L.	Lawyer	Effingham
Eaton, Herbert	Farmer	Philo
Ells, William C.	R. R Contractor	Las Vegas, N. M.
Estep, Harvey C.	Civil Engineer	Olympia, W. T.
Foster, Charles W.	Lawyer	Chicago
Gabrialial, Gregory	Missionary	Asia Minor
Gennadius, Panagiottis, B. S., Com. of Agriculture		Athens, Greece
Jeffers, Charles P.	Druggist	Ipswich, Mass.
Pierce, John L., B. A.	Lawyer	Champaign
Pickrell, William	Farmer	Beatrice, Nebraska
Reynolds, Henry S., M. S.	Assayer	Wickes, M. T.
Storey, George	Civil Engineer	San Diego, Cal.
Smith, Charles A., B. S.	Civil Engineer	Terre Haute, Ind.
Wharry, Walter W., Capt.		Sycamore
Watts, William	Physician	Sylvania, O.
Cheever, Alice	Mrs. A. H. Bryan	Champaign
Potter, F. Adelia	Mrs H S Reyn'lds	Wickes, M. T.

1875.

Name.	Occupation.	Residence.
Barnard, D. E.	Tanner	Kankakee
Barnes, Arthur E., B. S.	Druggist	Topeka, Kansas
Brown, Dillon S.	Druggist	Genoa
Brown, Ralph L., M L, Principal of Public Schools	Teacher	Wyandotte, Kansas
Coddington, Vantile W.	Architect	Kansas City, Mo.
Dobson, Franklin P., Capt.	Civil Engineer	Parker, Dakota
Dunlap, Henry M.	Farmer	Savoy
Dunlap, Burleigh A.	Lawyer	Urbana
Eaton, Ernest	Editor	Champaign
Everhart, Winfield S., Capt.	Lawyer	Toledo
Faulkner, James, Capt., Principal Public Schools.		Bodega, Cal.
Gridley, George, N A	Farmer	Half Day
Kenower, Geo. F., M. L., Principal Public Schools.		Belleville
Leplar, John E.	Clergyman	Leavenworth, Kan.
Lyford, Charles C., B. S.	Vet'r'n'y Surgeon	Minneapolis, Minn.
McCauley, John C.	Teacher	Montezuma, Ind.
Muller, John.	Physician	St. Louis, Mo.
Parsons, Fernando A., M. L.	Banker	Harper, Kansas
Patch, Emory	Machinist	Janesville, Wis.
Pickrell, Watson	Farmer	Beatrice, Nebraska
Pollock, William C.	Lawyer	Mt. Vernon
Robinson, Elna A.	Mechanic	Champaign
Scovell, Melville A., M. S. Professor of Agricultural Chemistry, Illinois Industrial University		Champaign
Scudder, Clarence O., Principal Public Schools.		Dixon
Shawhan, George R., B. L., County Superintendent of Schools, Champaign County		Urbana
Warner, L. Fenn, Civil Engineer, Central Pacific Railroad		Martinez, Cal.
Anderson, Laura	Mrs J R Gr'nhalgh	Champaign
Campbell, Amanda	Mrs Milton Moore	Philo
Kellogg, Flora L.	Teacher	Coldwater, Iowa
Lee, Alice, B. L.	Mrs Coddington	Kansas City, Mo.
Pierce, Fannie	At home	Champaign
Stewart, Maggie E., B. L.	Mrs H E Robbins	Lyons, Iowa
Steele, Mary C., B. L.	Mrs N C Ricker	Champaign

1876.

Name.	Occupation.	Residence.
Allen, Ralph	Farmer	Delevan
Ballou, Edward L	Mining	Igo, California
Campbell, James W	Lawyer	Topeka, Kansas
Chandler, William B	Farmer	Bourbon
Clark, Charles W	Civil engineer	St. Louis, Missouri
Drake, James F	Lawyer	South Pueblo, Col
Gill, John D	Lawyer	Chicago
Gore, Simeon T	Architect	Chicago
Gregory, Charles E., Captain	Lawyer	Sioux Falls, Dak
Knibloe, Walter E	Teacher	Girard
Mackay, Daniel S	Lawyer	Mt. Carroll
Mackay, Henry J	Lawyer	Mt. Carroll
Mackay, William A., Captain	Lawyer	Mt. Carroll
Mahan, H. Weston	Merchant	Champaign
Mann, Frank I., Captain	Nurseryman	Gilman
*Mann, A. Howard	*April 23, 1879	Winnebago, Cal
Mann, James R., Captain	Lawyer	Chicago
Noble, Louis R., B. S., Captain	Engineer	The Dalles, Oregon
Oliver, William F., Captain	Physician	Longton, Kansas
Palmer, Frank M., Captain	Lawyer	Kansas City, Mo
Pierce, Elon A	Teacher	San Jose, Cal
Rhodes, James F	*Lawyer	Durango, Colorado
Scribner, Artemus C	Com. merchant	Minneapolis, Minn
Starr, Frank A. E., Captain, Superintendent of Schools, Douglas county		Tuscola
Stookey, D. Wesley	Tile manufact'r	Buffalo
Weston, Charles H	Lawyer	Chicago
*Wild, George A., Captain	*Nov. 1881, at	Las Animas, Col
Williams, Thomas T	Farmer	Sterling
Holton, Mattie S	Mrs. C. I. Hayes	Champaign

1877.

Name.	Occupation.	Residence.
Abbott, Theodore S., B. S	Civil engineer	Laredo, Texas
*Allen, Charles W., B L	*July 8, 1880	Harristown
Barry, Charles H., Capt	Insurance agent	Chicago
Barry, Erank, B. L., Capt	Clerk	Minneapolis, Minn
Blackall, C. H., M. Arch, Capt	Architect	Boston, Mass
Brush, Charles E	Architect	Carbondale
Buckingham, William	Lawyer	Chicago
Bumstead, James E	Physician	Dundee
Clay, Luther G	Nurseryman	Cobden
Crow, Benjamin F	Engineer	Nebraska City, Mo
Elliott, Charles G	Civil engineer	Tonica
Faulkner, Richard D., Principal Public Schools		Ophir, Cal
Gibson, Charles B., Capt	Chemist	Chicago
Gilkerson, Hiram, Capt	Farmer	Hampshire
Gilkerson, John	Lawyer	Springfield
Kennedy, Allan G., Capt	Lumber mercha't	Eau Claire, Wis
Llewellyn, Joseph C., Supt. Street Railroad		St. Louis, Mo
Lewis, Edward V., Capt	Manufacturer	Council Bluffs, Ia
McPherson, John	Engineer	Lexington, Ky
Moore, John F	Civil engineer	Minneapolis, Minn
Rice, George C., Principal Public Schools		Muncie
Seymour, John J	Engineer	Seymour
Sim, Cole L., Capt	Druggist	Topeka, Kan
Spence, Franklin	Farmer	Hamilton
Stayman, John M	Clerk	Council Bluffs, Ia
Stoddard, Ira J., Capt	Civil engineer	Pella, Iowa
Ward, Walter P., B. L	Lawyer	Spencer, Iowa
Whitham, R. F., B. L., Capt	Farmer	Olympia, W. T
Wright, Myron J	Farmer	Woodstock
Adams, Nettie	Teacher	Tolono
Bogardus, Eva	At home	Champaign
Broshar, Cornelia	Artist	Champaign
Conn, Emma	At home	Champaign
Falls, Ida Bell	Teacher	Champaign
Gregory, Helen B., B. A	Artist	Chicago

1877—Continued.

Name.	Occupation.	Residence.
Maxwell, Emily C	At home	Philadelphia, Pa.
Page, Martha	Mrs. R. F. Whitham	Olympia, W. T.
Piatt, Emma C., B. S	At home	Monticello
Skinner, Velma E	Mrs. W. P. Ward	Spencer, Ia.
Smith, Avice	Physician	Champaign
Switzer, Gertrude	Music teacher	Champaign
Victor, Carrie	Teacher	Champaign

1878.

Name.	Occupation.	Residence.
Baker, Edward J., B. S	Farmer	Savoy
Ballard, Charles, B. S	Lumber merch't.	Kansas City, Mo.
Bridge, W. E., B. S., Capt	Farmer	Sedan, Kan
Brown, Frank A	Teacher	
Bullard, Samuel A., B. S	Architect	Springfield
Burr, Ellis M., B. S	Machinist	Champaign
Coffman, Noah B., B. S	Cashier	Hebron, Neb
Cofflin, T. S	Lawyer	Taylorville
Dean, Frank A., Capt	Merchant	Ulysses, Neb.
Gaffner, Theodore	Physician	Trenton
Gregory, A. T., B. A., Capt	Civil engineer	Albuquerque, N. M.
Hauser, Henry, B. S., Capt	Civil engineer	San Marcial, N. M.
Lee, Elisha O., B. S	Lawyer	Mt. Carroll
Lloyd, Frank H	Merchant	Champaign
McLane, James A., B. S	Architect	Chicago
Moore, Aaron H		
Morava, Wensel, B. S., Capt	Machinist	Chicago
Patchin, John	Teacher	Grass Lake
Pollock, James L., B. L	Lawyer	Mt. Vernon
Richards, Charles L., B. S	Farmer	Woodstock
Rudy, William D., B. S	Clerk	Washington, D. C.
Rutan, Abram R	Farmer	Renton, Texas
Sawyer, Hamlin W., Capt	Farmer	Champaign
Savage, Manford, B. L	Lawyer	Hebron, Neb.
Sparks, Hosea B., Capt	Clerk	Alton
*Spradling, William F	*Nov. 30, 1881	Greenleaf, Kan.
Sprague, Martin	Lawyer	Springfield
Weed, Mahlon O., B. S	Teacher	South Bend, Neb.
Whitlock, J. F., B. L., Capt	Medical student	Chicago
Ziesing, August, B. S., Capt	Civil engineer	Chicago
Columbia, Emma	Mrs. J. R. Mann	Chicago
Culver, Nettie M., B. L	At home	Henry
Davis, Nannie J	Mrs. M. A. Scovell	Champaign
Estep, Ida M	Clerk	Olympia, W. T.
Estep, Jessie	At home	Rantoul
Larned, Mary S	Mrs. F. A. Parsons	Harper, Kan.
Mahan, Jennie C	Mrs. P. W. Plank	Champaign
Page, Emma, M. L	At home	Champaign
Page, Mary L	Architect	Streator

1879.

Name.	Occupation.	Residence.
Beardsley, Henry M., M. L	Lawyer	Champaign
Bourne, Henry P., B. S., U. S. River Survey	Civil engineer	Cairo
Butler, Wm. N., Capt	Law student	Albany, N. Y.
Coburn, R. P., B. S., Capt	Merchant	San Antonio, Texas.
Freijs, Charles T., Capt	Architect	Chicago
Gunder, James, B. S	Civil engineer	Gunnison, Col.
Hoit, Otis W., B. S	Farmer	Geneseo
Johnson, William P., Capt	Merchant	Chicago
Kays, Emery	Farmer	Tonica
Kimble, Willis P., B. S	Civil engineer	El Paso, Texas

1879—Continued.

Name.	Occupation.	Residence.
Kuhn, Isaac, B. S.	Civil engineer.	Alberquerque, N. M.
Lee, Elisha, B. S.	Farmer.	Hamlet.
Milton, Franklin S., B. S.		Jerseyville.
Stanton, S. C., B. S., Capt.	Physician	England.
Swannell, Arthur, Capt.	Merchant.	Kankakee.
Taft, Lorado Z., M. L.	Art student.	Paris, France.
Thompson, W. A., B. S., Capt.	Merchant.	Chicago.
Walker, Francis E., Capt.	Merchant.	LaMoille.
Whitmire, Clarence L.	Medical student.	Iowa City, Iowa.
Butts, Augusta E., B. S.	Teacher	Paxton.
Deardorf, Sarah C., B. S.	Teacher	East Lynne, Mo.
Hale, Belle, B. S.	Teacher	Stillwater, Mich.
McAllister, Nettie C., B. L.	Mrs. J. H. Miller.	Sandwich.

1880.

Name.	Occupation.	Residence.
Bley, John, B. S.	Machinist	Chicago.
Briles, Bayard S.	Merchant	Etna.
Conklin, Roland R.	Loan agent.	Winfield, Kan.
Cook, Charles F., B. S.	Merchant	Edwardsville.
Groves, Charles.	Teacher	Champaign.
Hafner, Christian F.	At home	Oak Park.
Harden, Edgar E.	Lawyer.	Beatrice, Neb.
Hatch, Frank W., B. L.	Law student.	Chicago.
Heidenheimer, Benjamin F.	Draughtsman.	Chicago.
Jones, Richard D.	Law student.	Henry.
Kingsbury, Charles S., B. L.	Teacher.	Sidney.
Neeley Charles G., B. L.	Clerk.	Du Quoin.
Parker, William L., B. S.	Patent agent.	Chicago.
Robinson, Arthur S., B. S.	Draughtsman.	Las Vegas, N. M.
Robinson, Albert F., B. S.	Civil engineer.	Chicago.
Sondericker, Jerome, B. S., instructor in Drawing, Illinois Industrial University.		Champaign.
Savage, George M., B. L.	Teacher	Fairbury, Mo.
Travis, William W.	Law student.	Bloomington.
White, Frank, B. S.	Teacher.	Stillman Valley.
Bacon, Kittie I., B. L.	Teacher	Champaign.
Batchelder, Augusta.	At home.	Harristown.
Lucas, Corda.	Teacher.	Camargo.
Parker, Minnie A., B. L.	Teacher.	Tuscola.
Pearman, Ida, B. L.	Mrs. C.E.Stevens.	Logansport, Ind.
Watson, Ella M., B. S.	Teacher.	DeKalb.

1881.

Name.	Occupation.	Residence.
Allison, James G.	Clerk.	Chicago.
Armstrong, James E., B. S., Instructor in Natural History, Illinois Industrial University.		Champaign.
Beach, Bayard E., B. L.	Clerk.	Champaign.
Bellamy, Albert.	Clerk.	Girard.
Birney, Frank L.	Medical student.	Urbana.
Boothby, Arthur, B. S.	Farmer.	Pittsfield.
Boyd, Comma N., Captain.	Farmer.	Sheffield.
Coddington, Arch. O., B. L.	Teacher.	Wyandotte, Kansas.
Cooper, Frederick E., B. S.	At home.	Girard.
Davis, Arthur E., B. L.	Telegrapher	Crawfordsville, Ind.
Dennis, C. H., B. L., Captain.	Reporter.	Chicago.
Dressor, John C., B. S.	Farmer.	Cottonwood Grove.
Forsyth, James.	Student.	Champaign.
Hammett, F. W., B. S., Captain.	Farmer.	Camargo.
Hill, Fred L.	Surveyor.	Pullman.
Hill, T. C., B. A., Captain.	Teacher	Tolono.
Kingman, Arthur H.	Assayist.	Wakefield, Mass.

1881—Continued.

Name.	Occupation.	Residence.
McKay, Francis M., B. L., Principal West Jackson Street Public School		Chicago
Mansfield, Willis A., B. L.	Student of Med.	Chicago
Mason, William K., B. S.	Farmer	Buda
Morse, John H., Captain	*Teacher	Metamora
Pearman, J. Ora, B. S.	Medical student.	Champaign
Philbrick, E., B. S., Captain	Draughtsman	Chicago
Pepoon, Herman S., B. S.	Medical student.	Chicago
Pepoon, William A.	Clerk	Fremont, Nebraska.
Pletcher, Francis M., B. S.	Teacher	Lewisburg, Kansas.
Porter, Frank H., Captain		Jamestown, Dakota.
Ross, Sprague D., B. S.	Clerk	Cottonwood Grove.
Schwartz, Joseph	Druggist	Salem
Seymour, Arthur B., B. S.	Naturalist	Normal
Slade, Byron A., B. S., Captain	Clerk	Wabasha, Minn.
Stacey, Morelle M., B. L.	Teacher	Princeton
Sturman, James B., B. L.	Stenographer	Chicago
Talbot, A. N., B. S., Captain	Engineer	La Junta, Colorado.
Weston, William S., B. L.	Student	Champaign
Wilson, Maxwell B.	Farmer	Paris
Baker, Kittie M.	Music student	Chicago
Barnes, Bertha E., B. L.	Teacher	Pullman
Davis, Marietta, B. L.	Music teacher	Monticello
Elder, Loretta K., B. L.	At home	Chicago
Hammett, Jennie M., B. S.	At home	Camargo
Lawhead, Lucie M., B. L.	Teacher	Champaign
Lawrence, Nettie E.	At home	Belvidere
Macknet, Metta M. I., B. A.	*At home	Girard
Thomas, Darlie, B. L.	Clerk	Bloomington
Wright, Jessie A., B. L.	Teacher	Champaign

1882.

Name.	Residence.
Bailey, Samuel G. Jr., B. S.	Chicago
Barnes, Charles C.	Champaign
Bridge, Arthur M.	La Moille
Bullard, Benjamin F., B. L.	Mechanicsburg
Bullard, George W., B. S.	Springfield
Carman, William B., B. L.	Urbana
Cole, Edward E.	Champaign
Curtiss, William G.	Warren
Davis, Jepha H.	Monticello
Eichberg, David, B. L.	Atlanta
Eisenmayer, Andrew J., B. S.	Trenton
Harrison, Samuel A., B. A.	Alton
Merritt, Charles H.	Waterman
Neely, John R., B. L.	Du Quoin
Noble, Thomas	Todd's Point
Orr, Robert E., B. S.	Champaign
Peabody, Arthur, B. S.	Champaign
Palmer, Charles W., B. L.	Watseka
Richards, George W., B. S.	Quincy
Roberts, Charles N., B. S.	Jefferson
Rugg, Frederic D., B. L.	Champaign
Sharp, Abia J., B. S.	East Lynne, Mo.
Slaudeman, Frank, B. S.	Decatur
Slauson, Howard, B. S.	Bloomington
Smith, Charles L., B. L.	Champaign
Spencer, Nelson S., B. S.	Champaign
Taft, Florizel A., B. S.	Champaign
Todd, James, B. S.	Elgin
Turner, Herbert	Quincy
Wadsworth, John G.	Madison, Dakota
Andrus, Dora A., B. L.	Ashton
Avery, Kitty C., B. L.	Champaign
Cole, Fronia R.	Champaign
Raley, Arvilla K.	Granville

SUMMARY OF STUDENTS.

For the Year Ending June, 1881.

By Classes.	Gentlemen.	Ladies.	Total.
Seniors	39	11	50
Juniors	41	6	47
Sophomores	54	24	78
Freshmen	85	31	116
Preparatory	73	4	77
Special	7	4	11
Total	299	80	379

For the Year Ending June, 1882.

By Classes.	Gentlemen.	Ladies.	Total.
Resident Graduates	9	0	9
Seniors	31	4	35
Juniors	33	16	49
Sophomores	72	19	91
Freshmen	63	24	87
Preparatory	60	11	71
Special	8	2	10
Total	276	76	352
By Courses.			
Agriculture	21	.....	21
Mechanical Engineering	41	.....	41
Civil Engineering	41	.....	41
Mining Engineering	3	.....	3
Architecture	14	.....	14
Chemistry	41	1	42
Natural History	5	9	14
Art and Design	3	1	4
English and Modern Languages	57	50	107
Ancient Languages	12	4	16
Elective	10	4	14
Not specified	19	7	26
	267	76	343
Resident Graduates	9	.....	9
Total	276	76	352

The whole number matriculated as students since the opening is 1,969. The number graduated from the several colleges, including the class of 1882, is 337.

THE UNIVERSITY.

THE ORGANIZATION AND EQUIPMENT.

BUILDINGS AND GROUNDS.

The domain occupied by the University and its several departments embraces about 623 acres, including stock farm, experimental farm, orchards, gardens, nurseries, forest plantations, arboretum, ornamental grounds, and military parade ground.

The University buildings, fifteen in number, include a grand main building for public use, one large and two small Dormitory buildings, a spacious Mechanical building and Drill hall, a large Chemical laboratory, a Veterinary hall, a small Astronomical observatory, three dwellings, two large barns, and an ample green-house.

The Mechanical building and Drill hall is of brick, 126 feet in length and 88 feet in width. It contains a boiler, forge and tank room; a machine shop, furnished for practical use, with a steam engine, lathes, and other machinery; a pattern and finishing shop; shops for carpentry and cabinet work, furnished with wood-working machinery; paint room and rooms for models, storage, etc. In the second story is the large Drill hall, 124 by 80 feet, sufficient for the evolutions of a company of infantry, or a section of a battery of field artillery. It is also well supplied with gymnastic apparatus. One of the towers contains an armorer's shop and military model room, an artillery room and a band room. The other contains a printing office and editor's room.

The large Dormitory building is 125 feet in length and five stories in height. This was so badly damaged by storms in the spring of 1880 that it is not fit for use. It afforded 80 private rooms for students. Two smaller Dormitory buildings contain eight rooms each. The new Chemical building, erected in 1878 at a cost, including furniture, of $40,000, contains five laboratories, and is one of the best and largest in the United States.

ADMISSION AND GRADUATION.

CHOICE OF STUDIES.

It has been a favorite aim of the University from the outset, to allow as much freedom as possible in the selection of studies.

A University is designed not for children, but for men and women, who may claim to know something of their wants, powers,

and tastes. It is not useful to require every student, without regard to his capacity or practical wants, to take entire some lengthened "course of study." Each student should weigh carefully his own powers and needs, and counsel freely with his teachers as to the branches he may need to fit him for his chosen career, and then should pursue them with earnestness and perseverance, without faltering or fickleness.

It is necessarily required:—that the student should be thoroughly prepared to enter and keep pace with the classes in the chosen studies, and that he shall take these studies in the terms in which they are taught. Candidates for a degree must take the course of study prescribed for that degree.

Each student is expected to have three distinct studies, affording three class exercises each day. On special request, the Faculty may allow less or more.

No change in studies can be made after the beginning of a term, without permission of the Faculty.

Due care will be taken to prevent, as far as possible, all abuse of the liberty of choice. Students failing to pass satisfactory examinations in their chosen studies, will not be permitted to remain and take other studies without a vote of the Faculty.

REQUIRED STUDIES.

To secure the diffusion of the sciences relating to the great industries, the State Legislature, in 1873, prescribed that each student should be taught some of those sciences.

The Trustees accordingly require that each student shall take, each term, one study at least from the following list:

Physics, Chemistry, Mineralogy, Physical Geography, Anatomy and Physiology, Botany, Zoology, Geology, Entomology; Drawing and Designing, Mathematics, Surveying; Elements of Agriculture and Horticulture, Vegetable Physiology, Agricultural Chemistry, Agricultural Engineering and Architecture, Animal Husbandry, Rural Economy, Landscape Gardening, History of Agriculture, Veterinary Science; Architectural Drawing and Designing, Elements of Construction, Graphical Statistics, History and Esthetics of Architecture, Estimates, Mining Engineering, Metallurgy, Analytical Mechanics, Geodesy, Principles of Mechanism, Hydraulics, Thermodynamics, Strength of Materials, Prime Movers, Mill Work, Machine Drawing, Roads and Railroads, Construction and use of Machinery, Modeling and Patterns, Bridges, Stone Work, Astronomy; Military Science, and Political Economy.

EXAMINATIONS FOR ADMISSION.

Examinations of candidates for admission to the University, or any of its departments, are held at the University itself, the day previous to the opening of each term. These examinations embrace the following studies:

1. English Grammar, Arithmetic, Geography, and History of the United States, for all the Colleges. These examinations are as thorough as those required for second-grade certificates for teachers in the public schools.

2. Algebra, including equations of second degree and the calculus of radical quantities; Geometry, plain and solid. These are required also for all the Colleges.

3. Physiology, Botany, Natural Philosophy, English Rhetoric and Composition. These are required in addition to 1 and 2 for candidates for the Colleges of Agriculture, Engineering and Natural Science.

4. Physiology, Botany, Natural Philosophy, Latin Grammar and Reader. Cæsar, Cicero, Virgil, and Latin Prose Composition, in addition to 1 and 2, for School of English and Modern Languages.

5. Latin (as in 4), Greek Grammar and Reader, four books of Xenophon's Anabasis, and Greek Prose Composition, in addition to 1 and 2, for candidates for School of Ancient Languages.

For further information concerning terms of admission, see "*Admission*" under the several Colleges; also "*Preliminary Year.*"

COUNTY SUPERINTENDENT'S CERTIFICATES.

To prevent loss to those who are not prepared to enter the University, but might come, hoping to pass the examinations for admission, the following arrangement has been made:

County Superintendents of Schools will be furnished with questions and instructions for the examination of candidates in the four common branches, Arithmetic, Geography, English Grammar, and History of the United States; those who pass creditably will, when they present the Superintendent's certificate to that effect, be admitted to the classes of the Preliminary year.

ACCREDITED HIGH SCHOOL.

The Faculty, after personal examination, appoint accredited High Schools, whose graduates may be admitted to the University without further examination. These must be schools of first rate character, whose courses of instruction include all the studies required for admission to some one of the colleges of the University. On application, a member of the faculty is sent to examine the school making application, as to its facilities for teaching, its course and methods of instruction, and the general proficiency shown. If the report is favorable, the name of the school is entered in the published list of High Schools, accredited by the University. The graduates of these schools are admitted to any of the colleges for which their studies may have prepared them. The appointment continues as long as the work of the school is found satisfactory. Annual reports are asked from these schools.

ACCREDITED HIGH SCHOOLS.

Princeton High School	H. C. McDougall,	Principal.
Lake View High School	A. F. Nightingale,	"
Champaign, West, High School	M. Moore,	"
Decatur High School	J. N. Wilkinson,	"
Champaign, East, High School	I. L. Betzer,	"
Urbana High School	J. W. Hayes,	"
Oak Park High School	B. L. Dodge,	"
Chicago South Division High School	Jeremiah Slocum,	"
Chicago North Division High School	H. H. Belfield,	"
Chicago West Division High School	George P. Welles,	"
Hyde Park High School	Leslie Lewis,	Superintendent.
Marengo High School	C. J. Allen,	Principal.
Kankakee High School	F. M. Tracy,	"
Mattoon, East Side, High School	John T. Hall,	"
Springfield High School	F. R. Feitshans.	"
Monticello High School	H. T. Baker,	"
Warren High School	D. E. Garver,	"
Peru High School	Joseph Carter,	"
Peoria High School	Charles A. Smith,	"
Galena High School	R. L. Barton,	"
Shelbyville High School	Florence B. Webster,	"
Sycamore High School	A. J. Blanchard,	"
Rochelle High School	P. R. Walker,	"
Rossville High School	W. A. Chamberlain,	"
Bement High School	I. N. Wade,	"
Oakland High School	Charles I. Parker,	"
Jacksonville High School	D. H. Harris,	Superintendent.
Danville High School	S. Y. Gillan,	Principal.
Marshall High School	D. S. Kilborn,	"
Ottawa High School	H. L. Boltwood,	"

EXAMINING SCHOOLS.

The Trustees have authorized the Faculty to designate one or more High Schools in each county of the State, of sufficiently high grade and good reputation, whose certificates of examination, in the branches required of candidates for the University, may be received in lieu of the usual examination of the University.

These must be Graded, or High Schools of good reputation, and of sufficiently extended course to prepare students for the University. The principal teachers of the schools selected will be authorized to prepare questions and conduct examinations of any of their students desirous of entering the University, but the papers must be sent to the Universisy for final decision.

EXAMINING SCHOOLS.

Rockford, West, High School	W. W. Stetson,	Principal
Sterling, 2d Ward High School	Alfred Bayliss,	"
Belvidere High School	H. J. Sherrill,	"
Lanark High School	F. T. Oldt,	"
Belleville High School	Henry Raab,	"
Dwight High School	Jesse Hubbard	"
Macomb High School	J. F. Gowdy,	"
Rantoul High School	N. J. Betzer,	"
Kewanee High School	E. C. Rossiter,	"
Arcola High School	T. C. Clendenin,	"

PREPARATORY WORK.

To meet an urgent demand, the Trustees consented to provide for teaching the preparatory studies lying between the work of the common school and that of the University.

Candidates for these classes should not be less than fifteen years old. They must pass satisfactory examinations in Arithmetic, Geography, English Grammar, and History of the United States. The examination in these branches should be equal to that usually

required for a second grade certificate for teachers. This examination may be made by county superintendents. The studies taught in the preliminary year are as follows:

PREPARATORY STUDIES.

For the Colleges of Engineering, Agriculture, and Natural Science.

First Term.—Algebra—(Olney's Fundamental rules, Factoring, Common Divisors and Multiples, Powers and Roots, Calculus of Radicals, Simple Equations, Proportion and Progression. *Physiology*—(Dalton's or an equivalent.) *Natural Philosophy*—(Norton's or an equivalent.)

Second Term.—Algebra—Quadratic equations, etc. *Geometry*—Plane Geometry, Lines, Circumferences, Angles, Polygons, as far as equality in Olney's Geometry. *English.*—Elements of Composition. (Gilmore's Art of Expression or equivalent.) Orthœpy and Word Analysis. (Introduction to Webster's Academic Dictionary,)

Third Term—Geometry completed, including solid Geometry and the Sphere. *English* as is the second term, with addition of Goldsmith's Traveler, or an equivalent, read for analysis. *Botany*—Gray's Lessons in Botany, or an equivalent.

FOR COLLEGE OF LITERATURE AND SCIENCE.

First Term.—Algebra, as above. *Latin,* Cæsar. *Greek,* Grammar and Reader.

Second Term.—Algebra and Geometry, as above given. *Latin,* Cicero's Orations. *Greek,* Xenophon's Anabasis.

Third Term.—Geometry, completed. *Latin,* Virgil's Æneid. *Greek,* the Anabasis.

N. B.—Greek is required only for the School of Ancient Languages. The Sohool of English and Modern Languages requires Physiology, Natural Philosophy, and Botany instead of Greek.

Students in the preparatory studies are not matriculated as University students. They pay no entrance fee, but are charged a tuition fee of five dollars a term, and the incidental fee of seven and a half dollars a term. They have all the privileges of the library and of the public lectures.

N. B.—No student is matriculated as a college student until all preparatory studies are completed.

DEGREES AND CERTIFICATES.

The law provides that, "on recommendation of the Faculty, the Trustees may authorize the Regent, as President of the University, to issue diplomas to such persons as shall have completed satisfactorily the required studies, and sustained the examination therein, conferring such Literary and Scientific Degrees as are usually conferred by Universities for similar or equivalent courses of studies, or such as the Trustees may deem appropriate." Approved May 11, 1877.

In accordance with the law, the following system of degrees has been adopted for the University:

1. All studies will remain as heretofore, free. Each student may choose and pursue such studies as he may desire, subject only to such conditions as to preparation, times of study, and number of studies, as may be necessary to secure efficiency in classes and economy in teaching.

2. But students who wish to be candidates for any degree must complete fully the course of studies prescribed for such degree.

3. Students not candidates for any degree will be enrolled as special students, and will receive at the close of their attendance, if not less than a year, the certificates provided by law, with statements of work done and credits attained.

4. It is designed that the requirements for all the Bachelor's Degrees shall be, as nearly as possible, equal in amount and value.

5. The Degree of Bachelor of Science, B. S., will be given to those who complete either of the courses of studies in the Colleges of Engineering, Agriculture, or Natural Science. The name of the School will be inserted after the degree.

7. The Degree of Bachelor of Letters, B. L., will be given to those who complete the course in the School of English and Modern Languages.

8. The Degree of Bachelor of Arts, B. A., will be given to those who complete the course of the School of Ancient Languages.

9. The Masters' Degrees, M. S., M. L., and M. A., and the equivalent degrees of C. E., M. E., etc., will be given only to those who have pursued, and passed examinations on a year of prescribed post-graduate studies, or after a term of successful practice. In either case an accepted thesis will be required.

EXPENSES.

The Tuition is free in all the University Classes.

The matriculation fee entitles the student to membership in the University until he completes his studies, and must be paid before he enters. Amount	$10 00
The term fee for incidental expenses is, for each student	7 50
Room rent in University dormitory, each student per term	$2 00 to 6 00

Each student in the Chemical and Physical Laboratories, and in the Draughting and Engineering Classes, is required to make a deposit varying from 50 cents to $8, to pay for chemicals and apparatus used, and for any breakages or damages.

All bills due the University *must be paid before the student can enter* classes.

The following are the estimated maximum and minimum annual expenses, exclusive of books and clothing, of a residence of thirty-six weeks at the University:

	Minimum.	Maximum.
Term fees and room rent for each student	$28 50	$34 50
Table board in boarding houses and clubs	72 00	144 00
Fuel and light	10 00	15 00
Washing, at 75 cents per dozen	13 50	27 00
Total annual amount	$124 00	$220 50
Board and room in private houses, per week	$4 00	$6 00

FEES IN THE PRELIMINARY YEAR.

Tuition, per term	$5 00
Incidental fee, per term	7 50

SPECIAL FEES.

For music, for 20 lessons	$10 00
For painting or drawing, to special students	10 00
Graduating fee	5 00

CALENDAR FOR 1882-'83.

Examinations for admission	Monday,	September	11
First or Fall term begins	Wednesday,	September	13
First term ends	Wednesday,	December	20

WINTER VACATION.

FOR 1883.

Examinations for admission to advanced classes	Tuesday,	January	2
Opening of the second or Winter term	Wednesday,	January	2
Anniversary Day		March	11
Second term ends	Wednesday,	March	21
Third or spring term begins	Wednesday,	March	21
Baccalaureate address in University Chapel	Sunday,	June	3
Class Day	Monday,	June	4
Alumni Day	Tuesday,	June	5
Commencement	Wednesday,	June	6

SUMMER VACATION.

Examinations for admission	Monday,	September	10
First or Fall term begins	Wednesday,	September	12

APPARATUS AND EQUIPMENTS.

The College has, for the illustration of practical agriculture, a stock farm of 410 acres, provided with a large stock barn fitted up with stables, pens, yards, etc., and an experimental farm of 180 acres, furnished with all necessary apparatus. It has fine specimens of neat cattle, Short-horns and Jerseys, with several breeds of swine, to illustrate the problems of breeding and feeding. The Experimental Department exhibits field experiments in the testing of the different varieties and modes of culture of field crops, and in the comparison and treatment of soils. It includes experiments in Agriculture and Horticulture, under the direction of the Professors of Agriculture and of Horticulture, and experiments in feeding animals of different ages and development, upon the various kinds of food. In common with similar departments in the several Agricultural Colleges of the country, it attempts to accumulate knowledge preparatory to the development of an agricultural science.

Read from "Apparatus and Equipments" through pages 20, 21 and 22, after page 24.

The barn on the stock farm has north and west fronts of 80 feet each. Each limb, or L, is 40 feet wide. It is of the kind known as the side-hill barn. The barn on the experimental farm is of less size, but is fitted up with great convenience, and is supplied with a mill for grinding feed, run by a large wind-mill.

A Veterinary hall and stable has been provided, and a clinic is held to illustrate the lectures on veterinary science. The Department has Dr. Auzoux' celebrated complete model of the horse, in 97 pieces, exhibiting 3,000 details of structure; also *papier-machè* models of the foot and teeth of the horse at different ages.

Surveying and Drainage are illustrated by field practice with instruments, and by models. Agricultural chemistry is taught by lectures and laboratory practice, in the analysis of soils, fertilizers, foods, etc.

Upon the grounds devoted to the use of the College, there are: 1. An apple orchard planted in 1869, containing about 1,000 varieties, with pears, cherries, grapes and small fruits. 2. A nursery of young trees, in which students have regular work in grafting, etc. 3. A forest-tree plantation of the most useful kinds of timber. 4. An arboretum, in which hardy indigenous and exotic trees are planted as fast as they can be secured; it now contains nearly 100 species. The ornamental grounds which surround the University building occupy about twenty acres, kept in neat and attractive style. These, with the adjuncts of trees and flowering shrubs, lawn and beds of flowers and foliage plants, walks of different material and styles of laying out, illustrate the class-room work in landscape gardening. A green-house contains a collection of plants of great value to the classes in floriculture and landscape gardening, and furnishes practice in hot-house and green-house management.

Among the more notable may be mentioned a variety of palms, specimens of coffee, tea, banana, sugar cane, custard apple, orange, rubber tree, maranta, fig, aloe, pine-apple, pepper, New Zealand flax, camphor, cinchona, encolyplus, tamarind, cactus, acacia orchis.

Aside from the general library, museums and cabinets, the College has collections of soils, seeds, models of implements, photographs and engravings, a series of colored plaster casts of fruits prepared at the University; *models clastiques* of fruits and flowers from Paris; collections of specimens of woods, of beneficial and injurious insects; numerous dry and alcoholic specimens, etc. The herbarium is rich in specimens of useful and noxious plants, including many of the fungous parasites destructive to cultivated plants.

INSTRUCTION.

The full course occupies four years, and includes special agricultural, horticultural and veterinary studies. The first are designated: Elements of Agriculture, Agricultural Enineering and Architecture, Animal Husbandry, Rural Economy and General Farm Management. and History of Agriculture. The special horticultural studies are: Elements of Horticulture, Pomology and Forestry, Floriculture, Plant Houses and their Management, and Landscape Gardening. The veterinary studies are: Anatomy and Physiology of Domestic

Animals, Veterinary Medicines, Principles and Practice of Veterinary Science, Veterinary Sanitary Science, etc. During the Spring term there is a clinic at the infirmary, where numerous cases of diseased animals are presented and treated before the class free of charge to the owners. Instruction is usually given by lectures and illustrations from the College grounds and collections. The diversified farm crops, the living animals and plants, the collection of machinery, the buildings and appointments, are all useful in making instruction practical and possible. For those whose time is limited, a one year's course of technical study is provided. Special horticultural studies may also be chosen for one year's work.

The instruction unites, as far as possible, theory and practice—theory explaining practice, and practice illustrating theory. The technical studies are taught mainly by lectures, with careful readings of standard agricultural books and periodicals, and frequent discussions, oral and written, by the students, of the principles taught. These are also illustrated by demonstrations and observations in the fields, stables, orchards, gardens, plant-houses, etc.

THE ORGANIZATION AND EQUIPMENT OF THE UNIVERSITY.

WITH SOME ACCOUNT OF ITS WORK.

COLLEGES AND SCHOOLS.

The Institution is a University in the best American sense, though differing designedly in the character of some of its Colleges from the older institutions of this country. It embraces four Colleges, which are sub-divided into Schools. A School is understood to embrace the course of instruction needful for some one profession or vocation. Schools that are cognate in character and studies, are grouped in the same College. The following are the Colleges and Schools:

I. COLLEGE OF AGRICULTURE.

School of Agriculture.

II. COLLEGE OF ENGINEERING.

School of Mechanical Engineering. School of Architecture.
School of Civil and Mining Engineering.

III. COLLEGE OF NATURAL SCIENCE.

School of Chemistry. School of Natural History.

IV. COLLEGE OF LITERATURE AND SCIENCE.

School of English and Modern Languages.
School of Ancient Languages.

V. ADDITIONAL SCHOOLS.

School of Military Science. School of Art and Design.

Vocal and Instrumental Music, Elocution and Photography are also taught, but not as parts of the regular courses.

COLLEGE OF AGRICULTURE.

SPECIAL FACULTY.

The Regent,	Professor Prentice,
Professor Morrow, Dean,	Professor Scovell,
Professor Burrill,	Charles W. Rolfe.

OBJECT OF THE COLLEGE.

The aim of this College is to educate scientific agriculturists and horticulturists. The frequency with which this aim is misunderstood, demands that it shall be fully explained. Many, who look upon agriculture as consisting merely in the manual work of plowing, planting, cultivating, and harvesting, and in the care of stock, justly ridicule the idea of teaching these arts in a college. The practical farmer who has spent his life in farm labors, laughs at the notion of sending his son to learn these from a set of scientific professors. But all this implies a gross misunderstanding of the real object of agricultural science. It is not simply to teach *how* to plow, but the reason for plowing at all—to teach the composition and nature of soils, the philosophy of plowing, of manures, and the adaptation of the different soils to different crops and cultures. It is not simply to teach *how* to feed, but to show the composition, action, and value of the several kinds of food, and the laws of feeding, fattening, and healthful growth. In short, it is the aim of the true Agricultural College to enable the student to understand thoroughly all that man can know about soils and seeds, plants and animals, and the influences of light, heat, and moisture on his fields, his crops, and his stock; so that he may both understand the reason of the processes he uses, and may intelligently work for the improvement of those processes. Not "book farming," but a knowledge of the real nature of all true farming—of the great natural laws of the farm and its phenomena—this is the true aim of agricultural education. Agriculture involves a larger number of sciences than any other human employment, and becomes a fit sequence to any collegiate training.

The steady aim of the Trustees has been to give the College of Agriculture the largest development practicable, and to meet the full demand for agricultural education, as fast as it shall arise. Agricultural students are especially invited to the University.

Boards of Agriculture, Agricultural and Horticultural Associations, State and county, are invited to co-operate with the University in its efforts to awaken a more general appreciation of the value of education, and to add, by the establishment of scholarships, or other means, to the number of those who avail themselves of its facilities for instruction.

AGRICULTURAL COURSE.

Required for the Degree of B. S., in College of Agriculture.

FIRST YEAR.

1. Elements of Agriculture; Chemistry; Trignometry; Shop Practice (optional).
2. Elements of Horticulture; Chemistry; British Authors, or Free Hand Drawing.
3. Vegetable Physiology; Chemistry; Rhetoric.

SECOND YEAR.

1. Agricultural Chemistry (Soils and Plants); Botany; German.
2. Agricultural Chemistry (Tillage, Fertilizers, Foods); Botany; German.
3. Economic Entomology; Zoology; German.

THIRD YEAR.

1. Agricultural Engineering and Architecture; Animal Anatomy and Physiology; Geology or Ancient History.
2. Animal Husbandry; Veterinary Science; Physics or Mediæval History.
3. Landscape Gardening; Veterinary Science; Physics or Modern History.

FOURTH YEAR.

1. Meteorology and Physical Geography; Mental Science; History of Civilization.
2. Rural Economy; Constitutional History; Logic.
3. History of Agriculture and Rural Law; Political Economy; Laboratory Work.

ONE YEAR COURSE.

Students will be admitted to this course on passing a satisfactory examination in the common school branches, but they will receive greater benefit from it if they have made better preparation, especially if they have a good knowledge of Botany and Chemistry. They should not be less than eighteen years of age.

The studies are taught in the following order:

1. Elements of Agriculture; Agricultural Engineering and Architecture; Animal Anatomy and Physiology; Shop Practice.
2. Animal Husbandry; Rural Economy; Veterinary Science.
3. History of Agriculture and Rural Law; Veterinary Science; Practical Entomology or Landscape Gardening.

HORTICULTURAL COURSE.

Students wishing to make a specialty of Horticultural studies will in the third and fourth years of the Agricultural course substitute for certain of the above the following:

1. Pomology and Forestry.
2. Floriculture; Plant Houses and their Management.
3. Landscape Gardening.

COLEEGE OF ENGINEERING.

SPECIAL FACULTY.

THE REGENT,
Professor RICKER, Dean,
Professor SHATTUCK,
Professor PEABODY,
Professor BAKER,
Professor ROOS,
E. A. KIMBALL,
JEROME LONDERICKER.

SCHOOLS.

Mechanical Engineering, Architecture,
Civil and Mining Engineering.

SCHOOL OF MECHANICAL ENGINEERING.

OBJECT OF THE SCHOOL.

This School seeks to prepare students to invent, design, construct and manage machinery for any branch of manufactures.

APPARATUS AND EQUIPMENTS.

The Machine shop is a substantial brick structure, erected in 1871, for the purposes of this School, with that of Architecture and Military Tactics. It has a sixteen-horse power engine, and the machine tools most needed, including a planer, two engine and three plain lathes, drilling machines, etc. There is a pattern shop, a blacksmith shop, and the requisite amount of vises and bench-room. A collection of models and machines serves to illustrate peculiar structures and methods of applying force. This School is provided with plates and a cabinet of models, illustrating mechanical movements and elementary combinations of mechanism. This collection is rapidly increasing by our own manufacture, and by purchase from abroad. It includes many of Riggs' models, and others from the celebrated manufactory of J. Schrœder, of Darmstadt, Germany. About two hundred valuable models from the United States Patent Office are also included in the cabinet.

INSTRUCTION.

The elementary course in Mechanics begins with the second term of the Freshman year, following a term of elementary plane drawing, and continues to the end of the year. The student begins in the Pattern-shop, and is taught to produce simple forms of wood, and wood-turning. From this work he goes to the Blacksmith shop, where he practices drawing, squaring, bending, welding, and otherwise fashioning iron. Returning to the Machine shop, he learns to cut off, center and drill wrought and cast iron. He gives much

time at the bench in finding surfaces and forming shapes with the cold chisel and the file. His next lessons are at the hand lathe in turning iron and brass, and afterward at the engine lathe and the planer in turning, cutting screws, and in facing up various forms. In all this work he is under the constant supervision of a watchful master, who holds him strictly to correct methods, and makes him accountable for accurate results.

The object of this work is to teach correct ideas of the use and care of tools, and the development of forms, and the only result sought is accurate workmanship. The pieces, when finished, may go upon the scrap-pile, or into the melting-pot, if not wanted for samples.

In the second year, the student is employed upon some form of actual construction. The interest pertaining to doing a new thing is increased by giving that new thing a recognized utility. Some form of machine is chosen, such, for example, as the need of the shop itself may require. The subject is taken into the Drawing-room, its purposes and requirements are fully discussed, and the steps of the design are worked out. If at all complex, the whole class works upon the same drawings until the design has crystallized into definite shape. Then the parts are assigned to individuals. One takes a wheel, another a piece of the frame, or if the item be large, two persons work together upon it; detailed drawings are made and offered ror inspection. If found satisfactory, the drawing is taken to the Pattern shop and the pattern is made, which must also undergo rigid inspection before it can go forward to the Foundry. Thence the rough casting goes to the Machine shop, and receives such finishing, by such methods and with such tools, as the case may require. Thus the Sophomore class of 1879–80 have built the heavier parts of a large drill press. The standard of this machine is 84 inches high; its circular table, 25 inches in diameter, swings on the main pillar, and is raised and lowered by rack motion; it will be adapted for automatic or hand feed; its spindle will have a quick return motion; it has the usual fast and loose pulleys and back gears for use in boring large openings. In all respects the machine will be first-class. Having furnished class instruction to the class of last year, it is now doing a similar service to the present class, which will finish it during the present term. When complete all the work upon it will have been done by the students of the University, except the cutting of the gears, for which the shop has, as yet, no suitable machinery. The building of a milling machine will furnish useful instruction to classes yet to come.

The students of higher classes have a greater proportion of theoretical work, which their practical training will the better enable them to appreciate and profit by, with drawing and as much construction as time will permit. The commercial work which comes to the shop gives paid employment to the older pupils, whose elementary and practical courses have prepared them for such work. There is usually as much such work as the students have time for.

As in the other Schools, the time required to complete this full course is four years; the student taking, with the above, literary and scientific studies sufficient to keep him busily occupied during this time.

PHYSICS.

This subject is connected, in the professorship, with the foregoing; hence introduced in this place.

THE LABORATORY.

The apparatus has cost about five thousand dollars. Much of it is adapted for investigation, rather than illustration. The room is over the chapel, and like it is 60 feet by 80 feet; a transverse partition divides it equally. The northern part is used as a lecture room, and is capable of seating 350 persons, if necessary. The southern room is the laboratory, a beautiful apartment, having abundant light from the east, south and west. In the center of this room a case for apparatus has been enclosed, 16 by 20 feet, the upper part being made useful by a gallery. This case is glazed on three sides; the lower part affords abundant opportunity for the display of pieces of interest, while the gallery gives place for many things not less useful, though less attractive. Between the apparatus room and the lecture room is a space designed, primarily, as an ante-room for the lecture room, and having its floor on a level with the lecture platform. This room communicates, both above and below, with the apparatus room in its rear, and by ample sliding doors with the lecture room in front. Even if the lecture room is occupied, preparation may be made in the ante-room for a succeeding exercise, and at the time for change the required apparatus may be transferred in an instant, through the broad doorway. The ante-room, when closed, becomes a dark room, admirably adapted to such experiments as require total absence or perfect control of light. The ante-room and apparatus room occupy the center and on one side of the laboratory, leaving a space on the remaining three sides in which 50 students could work together, if occasion should require. Here are arranged the several forms of apparatus required for the experiments.

The study of physics occupies two college terms, in which there are each week five recitations from a text-book, one lecture and four hours of laboratory practice. In the latter, a series of about forty experiments are performed by each student, two working together according to a programme arranged for the purpose. Besides the written directions for the method of procedure, the student has the aid of the Professor and his assistants, when needful. Careful notes and calculated results are required, on paper of a given size.

MECHANICAL ENGINEERING COURSE.

Required for the Degree of B. S., in School of Mechanical Engineering.

FIRST YEAR.

1. Trigonometry; Projection Drawing; Shop Practice; French or German.
2. Analytical Geometry; Descriptive Geometry or Lettering; Shop Practice; French or German.
3. Calculus; Free Hand Drawing; Shop Practice; French or German.

SECOND YEAR.

1. Designing and Construction of Machines; Advanced Algebra; German or French.
2. Advanced Analytical Geometry; Designing and Construction of Machines; German or French.
3. Advanced Calculus; Astronomy; German or French.

THIRD YEAR.

1. Mechanism and Mechanical Laboratory; Advanced Descriptive Geometry; Chemistry and Laboratory Practice.
2. Analytical Mechanics; Chemistry and Laboratory Practice; Physics.
3. Analytical Mechanics; Modern History; Physics.

FOURTH YEAR.

1. Resistance of Materials and Hydraulics; Geology; Mental Science.
2. Prime Movers; Constitutional History; Construction Drawing.
3. Mill Work; Designing and Laboratory Practice; Political Economy.

In this course the student will take two years of French or German, but not one year of each.

SCHOOL OF CIVIL ENGINEERING.

OBJECT OF THE SCHOOL.

The School is designed to furnish a course of theoretical instruction, accompanied and illustrated by a large amount of practice, which will enable students to enter intelligently upon the various and important duties of the engineer.

INSTRUCTION.

The instruction is given by lectures, text-books and reading, to which are added numerous problems and practical exercises, as serving best to explain completely subjects and fix them in the mind. Models and instruments are continually used, both in lectures and by the students themselves.

COURSE OF STUDIES.

The studies taught in this School, as belonging specially to it, are as follows: Projection Drawing, Ornamental Drawing and Lettering, Topographical Drawing and Mapping, Descriptive Geometry, Land Surveying, Topographical Surveying and Levelling, Road and Railroad Engineering, Geodetic Surveys, Practical Astronomy, Descriptive Astronomy, Analytical Mechanics, Bridge Analysis and Designing, Bridge Construction, Foundations and Stone Work. Students of this School pursue studies in other schools of the University. Arrangements are making for an advanced or post-graduate course in Civil Engineering, which will include the following special subjects: Advanced Bridges, Tunnelling, Water Supply Engineering, Harbor and River Improvements, Arches and Stone Work, Drainage and Sanitary Engineering, Practical Astronomy, Theory of Least Squares.

APPARATUS.

For Field Practice.—The School has an equipment of instruments for instruction in Engineering in field work, including chains, tapes, compasses, plane tables, transits, stadias, levels, base rods and comparing apparatus, barometer for barometical levelling, sextants, engineer's transits arranged for astronomical observations, an observatory which is provided with an equatorial telescope, an astronomical transit, a zenith telescope, a chronometer, and a set of meteorological instruments.

A portable altitude and azimuth instrument of the latest and best form has lately been received from the celebrated makers, Troughton & Simms, of London. It is read by micrometer microscopes to single seconds, both of altitude and azimuth. This instrument will be used for instruction in Geodesy and Practical Astronomy.

To facilitate practice in trigonometrical and land surveying, an area has been specially prepared in which the difficulties of plane surveying are presented to the beginner as he is able to meet them, and where he is taught practical methods of overcoming them.

For the Lecture Room.—Models for illustrating the subjects of Descriptive Geometry, Astronomy, Roof and Bridge Trusses, Arches and Stone Work, and Railroad Superstructure. The School has a collection of students' manuscripts and drawing, and of authentic designs of bridges, roofs and engineering structures. It has also a complete set of maps of both the Coast and Lake Surveys. The College of Engineering has received the very large and excellent collection of lithographs of the lectures and drawings used in the Governmental Polytechnical Schools of France. The students of this School are steadily growing in favor with those seeking engineering services. During the past summer the demand was greater than the supply. Nearly all of the graduates are filling positions of responsibility and trust in their profession.

Students in Mining Engineering have all the facilities of the School of Civil Engineering, but instead of pursuing the special studies not closely related to their course, they have instruction in Metallurgy and Analysis of Coal, Mineral Waters, etc. The Geological and Mineralogical cabinets are well furnished with useful specimens, and the Metallurgical and Assaying laboratories have stamp-mill, furnaces, and other apparatus required for practical instruction in this department.

CIVIL ENGINEERING COURSE.

Required for Degree of B. S., in School of Civil Engineering.

FIRST YEAR.

1. Trigonometry; Projection Drawing; French or German.
2. Analytical Geometry; Descriptive Geometry and Lettering; French or German.
3. Calculus; Free-Hand Drawing; French or German.

SECOND YEAR.

1. Advanced Algebra; Land Surveying; German or French.
2. Advanced Analytical Geometry; Theory of Instruments and Surveying; German or French.
3. Advanced Calculus; Topographical Surveying and Drawing; German or French.

THIRD YEAR.

1. Advanced Descriptive Geometry; Chemistry and Laboratory Practice; Railroad Engineering.
2. Analytical Mechanics; Chemistry and Laboratory Practice; Physics.
3. Analytical Mechanics; Astronomy; Physics.

FOURTH YEAR.

1. Resistance of Materials and Hydraulics; Mental Science; Geodesy and Practical Astronomy.
2. Bridges; Constitutional History; Geology.
3. Stone Work; Political Economy; Bridge Construction.

In each of these two courses the student will take two years of German or French, but not one year of each.

SCHOOL OF ARCHITECTURE.

OBJECT OF THE SCHOOL.

The School prepares students for the profession of Architecture. For this a thorough knowledge of scientific principles applied to building, ability and correct taste in design, and a technical knowledge of the various building trades, witn skill in the use of tools, are necessary, and are prominent objects of the course of instruction.

INSTRUCTION.

The work of the School of Architecture, in imparting instruction and its aims and methods, may be classified under four heads:

1. The imparting of technical information.
2. Training in the use of the tools and methods employed in the building trades.
3. Training in the use of drafting instruments and materials.
4. Training in the art of original design.

1. *Technical Information*—Is given as to the materials and methods employed in the various building trades; a knowledge of the preparation of legal papers, contracts, agreements, specifications and estimates of cost; also a knowledge of the various architectural styles and their most prominent examples. This knowledge is almost wholly imparted by lectures, as few text-boooks are available, and they are illustrated by engravings, photographs and sketches with reference to work in the library. The lectures are concise, written witn a type-writer on transparent paper, and are then copied by the "blue" process. In this way each student can obtain a complete copy at much less cost than he can write it out for himself. The text is read more easily than manuscript, being in print. The lectures can be made as full and complete as desired, instead of being limited by the time of delivery, as is usually the case. Illustrations are also drawn on transparent paper and printed in the same way.

Training in the use of Tools.—The object of this is two-fold:

1. To give the student such knowledge of a trade, that if he meet with reverses in life, he will still have a means of honestly earning a living, or that he may do the work which is often required about a residence on a farm.

2. To teach the student practically the methods of construction which are in use in building, the proper use of the tools, and above all to know how work should be done, and the difference between good and bad work, so that he may know that good materials have been used and that the work has been well done. The special object of this is to prepare a student for taking charge of the construction of a building, as superintendent or architect, rather than to fit him merely for working at a trade. One year of honest work in the classes in shop practice proves sufficient to attain this result.

3. *Training in the use of Drafting Instruments.*—This study develops manual skill, cultivates habits of neatness and accuracy, ascertains the peculiarities of the materials and colors employed, and presents methods of finishing drawings and of distinguishing the different materials when these are required to be shown. The system of instruction is progressive. It commences with accurate line-drawing, then takes up shading in ink, sepia, line, and finishing in full color. About one-half the time is spent in making sets of the working drawings which are required for a building, from copies, from small sketches, and, when the student has become more proficient, from a small plan and a sketch in perspective, which is usually taken from one of the architectural journals.

4. *Training in the art of Design.*—Correct taste and the power of designing necessary to make the indispensable things of life beautiful, form the keystone in the education of the architect. After a student can make a good set of drawings from a sketch or small perspective, a programme of conditions and requirements for a small building is given to him. This is followed by others, increasing in difficulty as he acquires power, and ending with the most difficult structures which an architect is called upon to erect, except public buildings, which are reserved for the post-graduate course. In studying these problems, sketches at a small scale are first made and changed until satisfactory, great attention being paid to arrangement and convenience of plan. From these the student prepares a full set of working drawings neatly colored and shaded. Working drawings, similar to those made in architects' offices, are preferred to fine drawings, though as much time as can be spared is given to this branch of the art.

APPARATUS AND EQUIPMENTS.

The facilities for instruction at the School of Architecture are: 1. An excellent library. 2. The use of a fine art gallery, containing casts of sculptures, ornaments, and many photographs of buildings. (See School of Art and Design). 3. A good and rapidly increasing collection of models illustrating construction. 4. Tools and materials and instruction furnished in shop practice free of charge. 5. American, English, French and German architectural periodicals are regularly taken in the library.

The new Chemical laboratory was designed by the Professor of Architecture, assisted by students of the course. Many other pieces of work for the University have originated in the same way. A

school house at Rankin, Ill., was designed by an undergraduate student. It has given good satisfaction. Graduates are becoming well established as architects in several Western cities.

ARCHITECTURAL COURSE.

Required for the Degree of B. S., in School of Architecture.

FIRST YEAR.

1. Trigonometry; Projection Drawing; Shop Practice; French.
2. Analytical Geometry; Descriptive Geometry and Lettering; Shop Practice; French.
3. Calculus; Shop Practice; French.

SECOND YEAR.

1. Elements of Construction; Advanced Algebra; Free Hand Drawing and Modeling.
2. Elements of Construction; Advanced Analytical Geometry; Architectural Drawing and Designing.
3. Advanced Calculus; Graphical Statics; Water Color Sketching.

THIRD YEAR.

1. ArchitecturalDrawing; Descriptive Geometry and Drawing; Chemistry and Laboratory Practice.
2. History of Architecture; Analytical Mechanics; Physics.
3. History of Architecture; Analytical Mechanics; Physics.

FORUTH YEAR.

1. Esthetics of Architecture; Resistance of Materials and Hydraulics; History of Civilization.
2. Architectural Designing; Constitutional History; Geology.
3. Estimates, Agreements and Specifications; Heating and Ventilation; Architectural Designing; Political Economy.

BUILDER'S COURSE.

The Trustees allow persons desiring to fit themselves for master builders to take a course of a single year, pursuing such technical studies of the course in architecture as they may be prepared to enter upon with profit, and as will be most advantageous to them.

Candidates for the Builder's course must pass the examinations in the common branches, but need not pass in the studies of the preliminary year unless they shall desire to pursue other studies than those marked in the following schedule. Fee, $10 per term.

1. Wood Construction; Projection Brawing; Shop Practic (Carpentery and Joinery.)
2. Stone, Brick, and Metal Construction; Agricultural Drawing; Shop Practice (Stair Building).
3. Estimates, Agreements and Specifications; Heating and Ventilation; Architectural Designing; Shop Practice (Cabinet Making).

COLLEGE OF NATURAL SCIENCE.

SPECIAL FACULTY.

The REGENT,
Professor WEBER, Dean,
Professor BURRILL,
Professor TAFT,
Professor PRENTICE,
Mr. J. E. ARMSTRONG.

SCHOOLS.

School of Chemistry.
School of Natural History.

SCHOOL OF CHEMISTRY.

This School aims to impart such knowledge of Chemistry as will enable the student to apply the principles of the science to the related arts, and to fit him for the field of original research, or for the practical business of the druggist, pharmacist and practical chemist.

INSTRUCTION.

Text-book instruction in the principles of Chemistry and Chemical Physics occupy six weeks of the first term of the first year. Afterward the recitations alternated with laboratory practice. During the next three years each student is expected to work two hours daily in the laboratory, five days in the week. In order to graduate, each is required, at the close of his course, to make an original investigation, and present a thesis.

Students who pursue Chemistry as a part of other courses work at least two consecutive hours daily during such time as their specialty may require.

The special Chemical course requires for its completion four years of study. Associated with this there have been established a four years' course in Pharmacy and three years' courses in Agricultural Chemistry and Metallurgy.

APPARATUS.

The facilities offered for obtaining a practical knowledge of Chemistry are believed to be unsurpassed by those of any other institution in the West. A large laboratory building 75x120 feet, and four stories in height, was erected 1877–8, at an expense, including furniture, of $40,000. It is excellently lighted, heated and ventilated and contains the following apartments: One large lecture room, with seating capacity for two hundred students; one small lecture room for advanced students; a large laboratory for qualitative analysis, containing one hundred and four desks; a large laboratory for quantitative analysis, etc., containing sixty-four desks; a pharmacy, with

collection of specimens for *materia medica* and of officinal preparations made by students; a room for gas analysis; an assay room; store rooms, and a photographic gallery and other apartments.

The apparatus for general use includes a large platinum retort for the preparation of hydrofluoric acid; a Dove's polarizer, with a complete suit of accompanying apparatus; a Geissler's mercurial air pump; Hoffman's apparatus for illustrating the composition of compound gases; a Soliel-Scheibler's saccharimeter; an excellent set of areometers; a Hauy's goniometer; a camera with Ross' lenses; a Ruhmkorff's coil; galvanic batteries of Grove and Bunsen; also a potassium dichromate battery, a galvanometer, a spectroscope, and a large binocular microscope; a Hartnack microscope; a gas combustion furnace for organic analysis, etc.

COURSE IN CHEMISTRY.

Required for Degree of B. S., in School of Chemistry.

FIRST YEAR.

1. Chemistry and Laboratory Practice; Trigonometry; American Authors or French.
2. Chemistry and Laboratory Practice; Analytical Geometry; British Authors or French.
3. Organic Chemistry and Laboratory Practice; Free Hand Drawing; Rhetoric or French.

SECOND YEAR.

1. Agricultural Chemistry: Laboratory Practice; Physiology or Botany; German.
2. Agricultural Chemistry; Laboratory Practice; Microscopy; German.
3. Laboratory Practice; Zoölogy; German.

THIRD YEAR.

1. Laboratory Practice; Mineralogy; German.
2. Laboratory Practice; Physics; German.
3. Laboratory Practice; Physics; German.

FOURTH YEAR.

1. Laboratory Work; Mental Science; Meteorology and Physical Geography.
2. Constitutional History; Laboratory Work; Logic.
3. Political Economy; Geology; Laboratory Work.

Four courses of Laboratory work have been arranged, as follows:

CHEMICAL COURSE.

FIRST YEAR.

First Term.—Qualitative Analysis; Tests and Separation of the Alkalies, Alkaline Earths, N H_4 $_2S$ Group, and 1st and 2d Divisions of H_2S Group.

Second Term.—Qualitative Analysis Complete; Tests, and the Separation of 3d Division of H_2S Group, and the Acids; Analysis of 20 Simple Salts, and 20 Compound Substances.

Third Term.—Qualitative Analysis of Sodium Sulphate, Dolomite, Ammonium, Alum, Potassium Chloride, Bone Ash, Iron Ore.

SECOND YEAR.

First Term.—Quantitative Analysis of Calamite (Zinc Carbonate), Copper Pyrites, Galena, Spathic Iron Ore, Nickel Ore, Clay, Soil; Determination of Iron, Copper, etc. both volumetrically and gravimetrically.

Second Term.—Volumetric Analysis; Alkalimetry and Acidimetry; Preparation of Standard Solutions; Analysis of Sodium Carbonate, Sodium Hydroxide, Potassium,

Hydroxide, Pearl Ash, Cream of Tartar, Sulphuric, Hydrochloric, Oxalic, and Citric Acids; Analysis of Corn and other Grain.

Third Term.—Preparations of Salts, Acids, etc. Electroplating with Silver, Gold, Copper, Nickel.

THIRD YEAR.

First Term.—Ultimate Analysis; Determination of Carbon, Hydrogen, Oxygen, Nitrogen, Chlorine, Phosphorus, and Sulphur in Organic Compounds; Analysis of Urine.

Second Term.—Blow Pipe Analysis; Determination of a collection of minerals representing over thirty of the Metals; Assaying in both the dry and wet way of Gold, Silver, and Lead ores.

Third Term.—Photography; Preparation of Ether; Absolute Alcohol, Gun Cotton, Cadmium Iodide, Ammonium Iodide, Glacial Acetic Acid, Siver Nitrate, Collodion, Taking Negatives, Printing Positives, Toning and Mounting.

FOURTH YEAR.

First Term.—Gas Analysis; Calibration of Eudiometers; Analysis of Air from Lungs, Atmospheric Air, Marsh Gas, Illuminating Gas, and Crude Coal Gas; Analysis of Mineral Waters.

Second Term.—Toxicology; Micro-Chemistry of Poisons; Testing for Minerals and Vegetable Poisons; Separation from Organic Mixtures.

Third Term.—Original Researches.

PHARMACEUTICAL COURSE.

FIRST YEAR.

Same as in Chemical course.

SECOND YEAR.

First Term.—Quantitative Analysis of Commercial Drugs, White Lead, Red Lead, Paris Green, Sodium, Nitrate, Oxalic Acid, Tartar Emetic, Commercial Hydrochloric, Nitric, and Sulphuric Acids.

Second Term.—Analysis of Mineral Waters; Preparation of Tinctures, Solid and Fluid Extracts; Reading and Compounding Prescriptions.

Third Term.—Isolation of Alkaloids, Atropine, Strychnine, Quinine, Nicotine, Aconitine, Morphine; Preparation of Salycilic Acid; Examination of Alcoholic Liquors; Reading and Compounding Prescriptions.

THIRD YEAR.

First Term.—Same as second term, second year of Chemical course.

Second Term.—Same as first term, third year of Chemical course, without Analysis of Urine; Reading and Compounding Prescriptions.

Third Term.—Preparation of Salts, Perfumes, Flavoring Extracts, Cosmetics; Electroplating with Gold, Silver, Copper and Nickel.

FOURTH YEAR.

First Term.—Same as second term, fourth year, of Chemical course.

Second Term.—Analysis of Urine, normal and pathological; Reading and Compounding Prescriptions.

Third Term.—Original Researches.

AGRICULTURAL COURSE.

FIRST YEAR.

Same as Chemical course.

SECOND YEAR.

First Term.—Quantitative Analysis of Feldspar, Soil, Ashes of Plants and Grains.

Second Term.—Analysis of Commercial Fertilizers, Manures, and Minerals used for Fertilizers.

Third Term.—Preparation of Organic and Inorganic Salts; Starch from Potatoes, Corn, Wheat, etc., Sugar, Dextrine. Alcohol.

THIRD YEAR.

First Term.—Same as Chemical course.

Second Term.—Analysis of Milk, Corn, Wheat, Potatoes, Fruits, etc.

Third Term.—Silt Analysis of Soils; Analysis of Mineral Waters.

METALLURGICAL COURSE.

FIRST YEAR.

Same as in Chemical course, with the Quantitative Analysis of Brass, Solder, and Type Metal in third term.

SECOND YEAR.

First Term.—Same as Chemical course.

Second Term.—Assaying of Gold, Silver, and Lead Ores, both dry and wet ways; Blowpipe Assaying.

Third Term.—Analysis of Malachite, Azurite, Cinnabar, Tin Ore, Cobalt and Nickel Ore containing Arsenic, Bog Manganese, Grey Antimony.

THIRD YEAR.

First Term.—Analysis of Pig Iron, Wrought Iron, Steel, Furnace Slags, Rolling Mill Slags and Cinders.

Second Term.—Same as in Chemical course, with Analysis of Mineral Waters in place of Assaying.

Third Term.—Same as second term, fourth year, of Chemical course, with Analysis of Coal in place of Mineral Waters.

SCHOOL OF NATURAL HISTORY.

The aim of this School is to give a liberal scientific education. It acquaints the student as far as possible with what is known in respect to the structure of the earth and to the origin and distribution of its organic products; teaches him to collect and preserve specimens and arrange them for study, and to conduct original investigations.

The special studies of the course are: Botany and Vegetable Physiology, three terms, after one of preparatory study; Anatomy and Physiology; Zoölogy, two terms; and one term each of special Entomology; Osteology and Taxidermy; Geology and Palæontology, three terms; Physical Geography and Meteorology; Mineralogy; Astronomy, and Microscopy. The course occupies four years.

INSTRUCTION.

The methods of instruction vary according to the subjects taught, the time given to them, the facilities at hand and the aims of the instructors. It is the constant endeavor to make the course thoroughly practical and useful from an educational stand-point as well as to give the kind of knowledge necessary for the mastery of the material world.

APPARATUS AND EQUIPMENTS.

The Botanical laboratory has a growing herbanium, containing about eleven hundred and fifty species of flowering plants out of the fifteen hundred known in Illinois, a large number of flowering plants from other States and countries of the world, and a considerable collection of flowerless plants. Among these the Ferns and Fungi are the most important. There are compound microscopes and apparatus sufficient for use in the classes, so that during certain portions of his course every student has ample practice with them.

Collections of woods, of fruits, dry and alcoholic, of plaster casts, of microscopic preparations, of charts and drawings, make up, together with the green house and its specimens and the library, the facilities for the study of Botany and Vegetable Physiology. A considerable collection of insects, especially of those inhabiting our own State, aids in the study of Entomology. Most prominent, however, in the equipments of the School is the

NATURAL HISTORY MUSEUM.

The room for the Natural History collection is on the first floor of the west wing of the main building. From north to south it is seventy-six feet long; it is sixty feet wide and sixteen feet high. On the west side are six large windows, and on the south, three, which ordinarily afford abundant light.

Covering the entire wall on the east, and the spaces between the windows on the south and west, are two stories of wall cases; they are separated by a gallery on the three sides of the room, which is reached by iron stairs at the northeast and northwest corners. These cases, with continuous shelving, are eight feet high, provided with glazed doors.

There are also on each side of the room, opposite the spaces between the windows, five upright glazed cases, for the reception of such large specimens as could not be accommodated in the wall cases. The two extreme ones on either side are 10 feet 8 inches by 6 feet; and the three middle ones are 10 feet 8 inches by 3 feet 6 inches; all 8 feet high.

Directly opposite the windows, so as not to obscure the light, and between the floor cases on each side of the room, are table cases, glazed at top, sides and ends, for the reception of shells, minerals, or any small specimens. All this work of wood and iron was done at the University shops, and chiefly by the students of the architectural and mechanical classes.

A large case, 15 feet by 6 feet, and uniform with the rest, occupies the south end of the room, for the preservation of archæological specimens, Indian relics, and whatever else may be deemed worthy or instructive, in teaching the progress of civilization.

Arrangement of Contents.—On either side of the central space are arranged the large casts of Ward's collection of remarkable fossils, Directly in front, towards the south end, stands the gigantic *Megatherium.* Largely covering the north wall hang the slabs of the immense Saurian reptiles. The remainder of this remarkable collection of casts of fossils, numbering in all three hundred and twenty-six, are arranged in the lower wall cases at the south end of the room, and on the tops of the floor cases. This most valuable set of casts was presented to the University, when it had almost no cabinet, by Hon. Emory Cobb, President of the Board of Trustees.

The entire east side wall cases are occupied by small mammals, birds and skeletons; the mammals beginning on the north below, and occupying about one-third the length of the room. The birds follow, arranged at present according the system of Dr. Cones.

These occupy the remaining east cases below, and about two-thirds of the north part of the gallery. The remaining third is filled with skeletons of such animals as can be accommodated there.

On the south in the gallery, beginning at the east end, the first case contains the articulates; the second, the reptiles; the third, the fishes; the fourth, the radiates.

The floor cases on the west side contain the large ruminants (elk, deer, moose, mountain sheep and antelopes.) On the east a mounted buffalo with its skeleton, and skeletons of other large mammals. Part of the table cases contain sea, land and fluviatile shells, of about 1,700 species. The rest contain minerals and fossils. The cases on the west wall, below and above, are appropriated to geological specimens, rocks and fossils.

Almost the entire collection of mounted specimens has been put up at the University, and chiefly by the students themselves, many of whom are very expert. The skins have been bought or donated, and skilled labor applied at home. Thus all the large ruminants and the smaller mammals are home products. The birds, also, excepting six or eight, are products of the University. By this means half or more of the expense has been saved.

In Osteology, where specimens are usually expensive, many fine and valuable skeletons have been mounted at a comparatively small expense. The bones of the larger animals are macerated for six to twelve months; neatly cleaned, bleached, and properly fastened together by wires. These are called "artificial skeletons." Small mammals, birds, fishes and reptiles have their bones carefully scraped, leaving the joints connected by their natural ligaments; hence, these are called "ligamentous skeletons."

The Museum is peculiarly fortunate in its collections in Zoölogy, possessing, in mounted specimens or skeletons, nearly all the ruminants of North America, except the musk ox; and representatives of all orders of mammals, except *Probocidæ*; exhibiting 50 species by 80 mounted specimens, with numerous skeletons. In birds, it represents all the families of North America, having 240 species represented by over 300 specimens. Its fishes are about 100. Its articulates and radiates have received valuable accessions from the Smithsonian Institute.

All donations which are preserved as specimens in the Museum, have the contributor's name placed upon the label, *as donor*. Also, a book is kept, in which these names are entered, alphabetically, with specimen contributed. For contributions valued at more than fifty dollars, there is a special bulletin hanging in the Museum upon which the names of such contributors are written, with a statement of the donation and its valuation.

COURSE IN SCHOOL OF NATURAL HISTORY.

Required for the Degree of B. S., in School of Natural History.

FIRST YEAR.

1. Chemistry; Free Hand Drawing, (optional); Trigonometry; French.
2. Chemistry; Free Hand Drawing. (optional) Conic Sections; French.
3. Vegetable Physiology; Chemistry, or Free Hand Drawing; Rhetoric; French (extra.)

SECOND YEAR.

1. Anatomy and Physiology; Botany; German.
2. Zoölogy; Botany; German.
3. Zoölogy; Economic Entomology; German.

THIRD YEAR.

1. Geology; Minerology; German; Ancient History (optional, extra).
2. Geology; Physics; German; Mediæval History (optional, extra).
3. Geology; Physics; Modern History.

FOURTH YEAR.

1. Meteorology and Physical Geography; History of Civilization; Mental Science.
2. Microscopy and Fungology; Constitutional History; Logic.
3. Political Economy; Astronomy; Natural History; Laboratory Work.

In this course three terms of University Latin will be accepted in lieu of three terms of French; and five terms of such Latin for five terms of German.

COLLEGE OF LITERATURE AND SCIENCE.

SPECIAL FACULTY.

THE REGENT,
Professor SNYDER, Dean,
Professor PICKARD,
Professor SHATTUCK,
Professor CRAWFORD,
CHAS. E. PICKARD.

SCHOOLS.

English and Modern Languages.
Ancient Languages and Literature.

OBJECT OF THE SCHOOLS.

The object of the Schools in this College is to furnish a sound and liberal education to fit students for the general duties of life, and especially to prepare them for those business pursuits which require a large measure of literary and scientific knowledge and training. They meet the wants of those who wish to prepare themselves for the labors of the press as editors or publishers, for teachers in the higher institutions, or for the transaction of public business.

Students in the Agricultural and other technical Schools, desiring to educate themselves as teachers, writers, and professors, in their special departments, require a knowledge of the ancient, as well as the modern languages, to give them a full command of all the instruments and facilities required for the highest proficiency in their studies and proposed work. The University seeks through these Schools to provide for this important part of its mission—the furnishing of teachers to the industrial schools of the country, and investigators and writers for the arts.

INSTRUCTION.

The plan of instruction embraces, besides the ordinary text-book study, lectures and practical exercises in all the departments, in-

cluding original researches, essays, criticism, proof-reading and other work intended to illustrate the studies pursued, and to exercise the student's own powers. It is designed to give to all the students voice culture and a training in elocutionary practice.

A prominent aim will be to teach the right use of books, and thus to prepare the student for self-directed investigation and study, which will extend beyond the curriculum of his school and the period of his graduation. With this view, constant use of the already ample and continually enlarging stores of the library will be required and encouraged. As a further aid in this direction, members of the advanced classes are usually selected to act as assistant librarians. In this service they are able to obtain much valuable knowledge of various departments of literature and science, of prominent authors, and to the extent and scope of their writings. Of special value, as an incentive to, and the means of practice in, English composition, should be mentioned THE ILLINI, a semi-monthly paper edited and published by the students of the several Colleges, each of which is appropriately represented in its columns. A printing office has been provided in the Mechanical building, and is furnished with all requisite material.

THE LIBRARY.

This is a general collection of books and papers for the use of all departments of the University. It contained September 1, 1882, thirteen thousand five hundred and ten volumes, an increase in two years, since the last report of the Trustees of the University, of one thousand and sixty volumes. There are also between two and three thousand pamphlets. The number of the latter varies, since the more valuable ones are bound from time to time.

The library receives regularly, at present, eight periodical publications, divided as follows:

Agricultural, etc	21
Natural Science	17
Engineering, etc	18
All other	24

Of the last class, the most are free contributions, including the papers of Champaign and some of the adjoining counties.

The amount expended in the library has been fifteen hundred dollars a year, for the two years, being the State appropriation for the library.

The fine Library hall is used as a reading room, from which, however, students are not allowed to take books, except by special permission. It is open five days in the week, from eight A. M. to five P. M., and Saturdays from two to five P. M.

The use of the library is urged upon students in all the classes; and any person is welcome to consult the books, under the same conditions as are imposed upon students.

GENERAL STUDIES.

Mathematics, History, Philosophy and Logic, are more or less included in all the courses of study in the University; they are as appropriately mentioned here as elsewhere.

PURE MATHEMATICS.

The completion of this course requires two years of study.

Advanced Geometry.—Applications of Algebra to Geometry; Transversals; Harmonic Proportions, etc. *Trigonometry*—Analytical and Plane. Relations between the functions of an arc. Formation and use of tables; Solution of plane triangles. *Analytical Geometry.*—Construction of equations; Discussion, in a plane, of the point, right-line, circle, ellipse, parabola and hyperbola; Higher plane curves, cycloid, cissoid of Diocles, etc. *Differential Calculus.*—Differentials of algebraic and transcendental functions; Maclaurin's Theorem; Taylor's Theorem; Maxima and Minima of functions of one variable; Equations of tangents, normals, sub-tangents, sub-normals, etc.; Differentials of lines, surfaces of volumes. *Integral Calculus.*—Integration of elementary forms and of rational fractions; Rectification of plane curves; Quadrature of plane areas and surfaces of revolution; and Cubature of solids of revolution.

Advanced Algebra.—Binomial Theorem; Properties and summation of series; Exponential quantities, Logarithms; General theory and methods of solving equations. *Analytical Geometry.*—Loci in space; Surfaces of the second order. *Differential Calculus.*—Differentials and Maxima and Minima of functions of two or more variables; Osculatory curves; Radius of curvature; Evolutes, involutes and envelopes; Discussions of algebraic and transcendental curves and surfaces; Tangent and normal planes; Partial differentials of surfaces and volumes. *Integral Calculus.*—Integration of transcendental and irrational differentials; Differentials of higher orders; Differential equations; Rectifications, quadrature and cubature in general. *Spherical Trigonometry.*—General Formulas; Solution of Spherical Triangles. *Calculus of Variations* will be taught to advanced students.

HISTORY AND SOCIAL SCIENCE.

The historical studies are designed to afford a general view of the history, social organization and progress of the race. They embrace also the history of the arts and sciences, and of civilization, the principles of civil polity and law, the philosophy of history, and the principles of political economy and constitutional law. The course occupies six terms in the third and fourth years of the University courses.

PHILOSOPHY AND LOGIC.

Mental Philosophy.—Analysis and classification of mental phenomena; theories of perception, consciousness, imagination, memory, judgment, reason. Mental Physiology, or connection of body and mind; healthful conditions of thought, growth and decay of mental and moral powers. Philosophy of education. Theory of conscience; Nature of moral obligation, moral feeling. The right. The good. Practical ethics; Duties. Formation of character. Ancient Schools of Philosophy; Modern Schools of Philosophy. Influence of Philosophy on the progress of civilization, and on modern sciences and arts.

Principles of Logic.—Conditions of valid thinking; forms of arguments; fallacies and their classification. Inductive and scientific reasoning; principles and methods of investigation. Practical applications of logic in the construction of argument, in the detection and answer of fallacies, and in the formation of habits of thinking, and the common judgments of life.

SCHOOL OF ENGLISH AND MODERN LANGUAGES.

English Language and Literature.—In the arrangement of the studies the endeavor is to present a thorough and extended drill in grammatical and philological study, and in the authors and history of the English language, affording a training equivalent to the ordinary studies of the classical language. This drill extends through three years of the course, but may be shortened according to the ability and preparation of the student.

The first two terms of the first year are given to a general survey of the whole field of British and American Literature from the middle of the sixteenth century to the present time. All the really representative writers come into notice, and representative specimens from the writings of each are carefully read in class. Moreover, each student is required each term to read the entire work of some classic author, making choice from a prescribed list. Frequent exercises in writing abstracts or original compositions on themes assigned are also required. The study of Rhetoric occupies the third term.

During the second year some four or five of the great masters are studied, their work analyzed, the shaping forces of their times and their influences upon succeeding times are investigated. Lectures are given from time to time on Poetry—epic, lyric, dramatic, etc. Writing and reading required as in first year.

In the Senior year attention is given to old English; to the Anglo-Saxon, for which the way has been prepared by the study of both English and German; to Philology; to the Philosophy of English Literature, and to Æsthetics. Essays, forensics and orations are required.

French and German.—The modern languages taught in this School are confined to one year of French and two years of German. Abundant practical exercises are given both in composition and translation, and the diligent student gains the power to read with ease scientific and other works in these languages, and may, with a little practice, write and speak them with correctness. A constant attention is also given to the etymologies common to these languages and the English, and thereby a large advantage is gained by the student in linguistic culture. "He who knows no foreign tongue," said Goethe, "knows nothing of his own."

In the first year the student passes over a complete grammar and reader, acquiring a knowledge of the technicalities of the idiom, with a sufficient vocabulary for the use of books of reference within the course. The second year is devoted to a critical study of the languages and philological analysis, and to a course of select classic reading, composition and conversation.

COURSE IN SCHOOL OF ENGLISH AND MODERN LANGUAGES.

Required for the Degree of B. L.

FIRST YEAR.

1. American authors or Cicero de Amicitia; French; Trigonometry.
2. British Authors or Livy; French; Conic Sections.
3. Rhetoric; French; Advanced Geometry, or Free-Hand Drawing; Horace (optional, extra.)

SECOND YEAR.

1. English Classics; German; Physiology, or Botany.
2. English Classics; German; Zoölogy, or Botany.
3. English Classics; German; Astronomy.

THIRD YEAR.

1. German; Chemistry; Ancient History.
2. German; Physics or Chemistry; Mediæval History.
3. German; Physics; Modern History.

FOURTH YEAR.

1. Anglo-Saxon; Mental Science; History of Civilization.
2. Early English; Constitutional History; Logic.
3. Philology; Political Economy; Geology.

SCHOOL OF ANCIENT LANGUAGES AND LITERATURE.

In the school of Ancient Languages and Literature, the methods of instruction without swerving from their proper aim, to impart a sufficiently full and critical knowledge of the Latin and Greek languages and writings, will make the study of these tongues subservient, in a more than usual degree, to a critical and correct use of the English. With this view, written translations, carefully prepared, with due attention to differences, equivalences, and substitution of idioms, and the comparison and discrimination of synonyms, will form part of the entire course.

The study of Latin and Greek Composition will constitute a weekly exercise through the first year, and will be continued, to some extent, through the course. Essays, historical and critical, will be required from time to time, in connection with the works read, and a free use of the library is urged. It is intended that each student who contemplates the course in Ancient Languages shall have a clear knowledge of the history of Greek and Latin Literature, and of the principal authors in both languages. As an aid to the appreciation of the literature of the two peoples, Greek and Roman history will form an important part of the course, and will be taken up in the beginning, illustrating the works read. In the first term of the third year ancient history is taken up as a separate study, and especial attention is then given to the history of Greece and Rome, and the nations with whom they came in contact. Classes will be formed for students who wish to carry their classical study farther than the prescribed course, and every assistance will be given them.

For the studies in *History, Philosophy, etc.*, see School of English and Modern Languages.

For the studies in *Mathematics and Natural Science*, see Schools of Mechanical Engineering and Natural History.

COURSE IN SCHOOL OF ANCIENT LANGUAGES.

Required for Degree of B. A.

FIRST YEAR.

1. Cicero de Amicitia and prose composition; Iliad and prose composition; Trigonometry.
2. Livy and prose composition; Boise and Freeman's selections from Greek authors and prose composition; Conic Sections.
3. Odes of Horace and prose composition; Memorabilia and prose composition; Advanced Geometry.

SECOND YEAR.

1. Satires of Horace; Thucydides or German; Physiology.
2. Terence; Sophocles or German; Zoölogy.
3. Tacitus; Demosthenes or German; Astronomy.

THIRD YEAR.

1. Juvenal or French; Chemistry; Ancient History.
2. Quintilian or French; Physics; Mediæval History.
3. De Officiis or French; Physics; Modern History.

FOURTH YEAR.

1. History of Civilization; Mental Science; Meteorology and Physical Geography.
2. Constitutional History; Early English; Logic.
2. Philology; Geology; Political Economy.

ADDITIONAL SCHOOLS, NOT INCLUDED IN THE FOUR COLLEGES.

SCHOOL OF MILITARY SCIENCE.

PROFESSOR WM. T. WOOD,

SECOND LIEUT. 18TH INFANTRY, U. S. A.

By the law of Congress, and of the State, the University is required to teach Military Tactics to its students. All able-bodied male students of the college classes of the first, second and third years are enrolled in the companies of the University battalion, and receive instruction in the following military exercises:

School of the Soldier; Manual of Arms.
School of the Company; Movements by Platoons, Firing, etc.
School of the Battalion; Ployment and Deployment of Close Columns.
Battalion and Company Skirmish Drill; Bugle Calls.
Bayonet Fencing; Target Practice.
Guard and Picket Duties; Duties of Sentinels.

CLASS IN MILITARY SCIENCE.

Classes in military science and tactics, as far as is requisite for officers of the line. From these classes are selected the officers of

the several companies, for which they act as instructors. The military instruction is now under the charge of Lieut. Wm. T. Wood, a graduate of the U. S. Military Academy, and an officer of the regular army of the United States. A full supply of arms and ammunition is furnished by the War Department, including 300 cadet rifles and accoutrements, two pieces of field artillery, 1,000 ball cartridges and 1,000 blank cartridges annually for target practice, with 100 cartridges and 300 friction primers for artillery.

No student is eligible to the military class till he has reached the third term of the Freshman year, and is in good standing in all his studies. The course of instruction is confined strictly to two years. No student will be permitted to retain a command who does not maintain a good standing in conduct and scholarship.

The instruction and class exercises occupy about three hours each week, arranged as far as possible so as not to interfere with any other courses of study, to allow the members of other courses to enter this. Students must be careful, however, to ascertain, before entering the military class, that the proper studies and exercises of their chosen courses will not be interfered with.

Commissions.—The Governor of the State is accustomed to commission as captains in the State militia, such graduates of the University as have completed the studies of the military classes and have obtained the requisite experience in command in the University battalion. In order to obtain the commission the student must be approved by the Faculty and pass satisfactorily an examination in military science and tactics before a committee appointed by the Faculty of the University. It is expected that in order to get the required experience in command, the members of the military class of the third or Junior year will serve as commissioned officers of the several companies of the battalion.

University Uniforms.—Under the authority of the acts of incorporation, the Trustees have prescribed that all male students, after the first term, shall wear the University uniform. The University cap is to be worn from the first. The uniform consists of a suit and a cap of cadet gray cloth. Students can procure them ready-made on their arrival here. The University cap is ornamented in front with the initials I. I. U., surrounded by a wreath. Students will always wear their uniforms on parade, but in their rooms and at recitations may wear other clothing.

The University Library contains many books on Military Science, Military History and Engineering.

Gymnasium.—The Drill Hall is furnished with a full set of gymnastic apparatus, and classes in gymnastic exercises are organized in the fall and winter terms under careful leaders. Fee 50 cents.

The University Cornet Band is composed of students, who, while members of the band, are excused from drill and other college exercises.

COURSE IN SCHOOL OF MILITARY SCIENCE.

FIRST YEAR.

1. School of the Soldier and Company; Bayonet Fencing.

SECOND YEAR.

1. School of Battalion; Skirmish Drill.
2. Ceremonies and Reviews; Military Signalling; Sword Fencing.
3. Guard, Outpost and Picket Duty; Military Signaling; Sword Fencing.

THIRD YEAR.

1. Military Administration; Reports and Returns; Theory of Fire Arms; Target Practice; Artillery Drill.
2. Organization of Armies; Art of War; Field Fortifications; Artillery Drill.

SCHOOL OF ART AND DESIGN.

The School of Art and Design, begun in 1876, occupies a large, well appointed apartment in a wing of the main University building. Light is admitted from three sides and managed by will by curtain partitions. The necessary tables, desks, easels, etc., are provided for large classes of students. In the center is a room of glazed sash for the convenient storing of copies and of examples of class work as well as the exhibition of objects requiring protection. In an adjoining smaller room there is a valuable collection of paintings and sketches, the property and mostly the work of the Professor in charge of the School. Students have access to this room.

The importance of having in the Illinois Industrial University a practical course of art instruction, was duly recognized by the authorities of the University. The exhibits made by the different art schools, both foreign and American, at the Philadelphia Exposition, revealed the fact that the most useful results had been attained by a mode of teaching quite different from that commonly practiced in our schools. During the years 1876 and '77, by direction of the Trustees, the classes in industrial drawing and designing were formed into a regular school, called the School of Art and Design. Its object was stated to be to assist in the general college work, and to furnish a thorough artistic education to those who should wish to pursue industrial or fine arts as a specialty, either as designers, teachers or artists. Such work as tends directly or indirectly to aid the general student is here briefly stated:

1. To develop the power of observation, that the eye may become susceptible to the beauties of the surroundings in nature, so as quickly to perceive and understand the laws of harmony, perspective, shades and color, and to realize complex forms, such as are found in plants, insects, etc.

2. The training of the hand to delicacy and skill in the use of mediums or implements wherewith to accomplish what the mind directs.

3. To familiarize the student with classical forms of objects, and ornamentation, so as to distinguish different styles, and to cultivate a correct taste.

A two years' elementary course embraces such studies as are especially important to various professions, and therefore meets the wants of the several colleges having free-hand drawing in their courses; besides, it qualifies for entering the higher course in Designing or Fine Arts.

The advanced course, instead of being arranged for a definite length of time, requires a more specific amount and quality of work. An important feature is the opportunity that students have for fitting themselves as practical teachers. Those who have acquired sufficient knowledge are frequently called upon to assist beginners. Lessons are prepared, which, after being criticised and approved, are delivered before the class. This inspires the student with confidence, makes a thorough review of a subject, and stimulates him to do his very best.

As soon as the student fairly appreciates decorative forms, he is taught to combine them artistically, so as to form original designs suitable for some practical purpose. The instruction is by lectures, illustrated by rapid drawings upon the board. Each student also receives individual attention after the lecture; this prevents any error passing unnoticed.

With very few exceptions, the students in attendance have proved themselves earnest workers, and many have exhibited marked talent; a number of ladies and gentlemen have produced some good work in oil colors and crayon. This last branch of art might be carried to a high state of success, even without special encouragement. It is, however, not so important to the industries of the State as the branch in designing.

ART GALLERY.

There is no more attractive place for great numbers of visitors at the University than its large and finely arranged Art Gallery, in the west wing of the main building, on the third floor. The cost has been about three thousand dollars, but this sum has been so expended that a display is made equal to that obtained by many times the outlay in many kindred collections. There are no paintings, for the limited means would not permit their purchase, nor could the results of the sum expended prove nearly so interesting and instructive by thus dividing it. The gallery owes its existence, in the first instance, to Dr. John M. Gregory, who originated the scheme, and, aided by the liberality of the citizens of Champaign and Urbana, selected and purchased the art objects. The larger portion of these were secured in Paris, France. To secure the needful means, lectures were given, whose proceeds went for this purpose; a subscription was taken up among citizens, including members of the Faculty, and other ways resorted to for raising the amount. The University furnishes the room; otherwise, the State has been at no expense for the valuable and beautiful gallery. The following figures show the liberality of the donors; many contributed smaller amounts:

Six each gave	$100 00	Eight each gave	$50 00
Thirty-five each gave	25 00	One gave	40 00
Two each gave	20 00	Twelve each gave	10 00

The hall is 61×78 feet. The wall is tinted a dark maroon color, making a beautiful background for the white casts. The arrangement is such that a view is obtained, on entering, of nearly every thing in the room, the first sight being impressive, and ordinarily eliciting exclamations of surprise from the hundreds of visitors passing the threshold.

Statues.—There are sixteen full-sized statues, among which are the Laocoön Group, Venus de Milo, Venus de Medicis, Diana de Gabies, Faun of Praxiteles, Gibson's Venus, Dying Slave of Michael Angelo, etc. Of the reduced size statues, there are forty-two, including the Apollo Belvidere, Diana the Huntress, Achilles, Minerva, Dying Gladiator, etc. There are ninety-two full-sized busts, representing famous persons of all ages, from Homer to many now living. Among these, we find ten Roman Emperors, Hippocrates, Socrates, Demosthenes, Cicero, Lord Bacon, Dr. Johnson, Gladstone, Washington, Webster, Douglas, Lincoln, etc. There are twenty-eight busts of smaller size from the best artists.

Bas-Reliefs.—Forty-two pieces. We name, as among the prominently noticeable ones, the Architrave of the celebrated Ghiberti gates in the Baptistery at Florence, Garden of Eden, Cain and Abel, Assyrian Sculpture excavated in 1848, Lion Hunt, Four Seasons, etc.

Medallion Beads.—Large size, twenty-seven; smaller, four hundred and ninety. These have their names stamped upon them.

Engravings.—There are fifty-four beautiful engravings from paintings by Raphael, Landseer, David, Hessig, Turner, Hogarth, etc.

Photographs.—Two hundred and thirty-two. Roman views, views of Venice, Switzerland, of noted paintings, of bas-reliefs, etc.

Portraits.—Four hundred and seven lithographs of eminent personages, mostly French, with name, date and other information marked on each.

COURSE OF INSTRUCTION IN SCHOOL OF ART AND DESIGN.

Students not seeking a professional training may yet avail themselves of the two years' course in industrial art. Any person of ordinary ability who faithfully completes this course will be qualified to teach drawing and designing in the public schools, or enter professions with great advantage in the various branches of industry, where artistic skill and taste are indispensable to success.

FIRST TERM.

(Exercises in outline.)

Elements of Form; Analysis of Compound Forms; Elementary Designs; Elementary Perspective by aid of objects; Elements of Historic Ornaments; Memory Exercises.

SECOND TERM.

Enlargement and Shading from copy; Ornamental Designs from plant form; Naturalistic and Conventional Arrangement; Harmonious Lines and Distribution of Form; Perspective Drawing of Objects, Plants, etc. Features of the Human Head; History of Early Art.

THIRD TERM.

Outline Drawing and Shading from Casts of Ornament; Application of Decorative Forms to flat and round surfaces under various conditions; Designs for specified objects; Advanced Perspective and Shadows; Harmony and Contrast of Color, (Lectures on Art and its History).

FOURTH TERM.

(Clay and Wax Modeling.)

Basso Relievo Ornament from the Solid. Features and the Human Head from description; Relievo Ornament from shaded copies or Drawings; Original Designs for decorative purposes; Enlargements and Reduction from casts; History of Styles of Ornament.

FIFTH TERM.

Shading from Statuary, Casts, etc.; Drawing of Landscape and Animals from copy in charcoal and sepia; color applied to Decorative Art; designs for useful objects; perspective drawings of interiors of rooms.

SIXTH TERM.

General review of the principal work done; Specimen plates to be completed; Optical and Physical principles of color in Nature; Aerial Perspective; Sketching from Nature in charcoal and color; Artistic Anatomy of Form and Proportion, by illustrated lectures; famous artists and their principal works.

Students having passed satisfactorily in the above course will be permitted to enter the advanced classes.

The following course is for those who wish to become accomplished either as designers, painters or teachers. In order that the student may acquire thoroughness in the branch he wishes to pursue as a specialty, the subject has at this stage been formed into two divisions, decorative and pictorial. The teacher student must give attention to both branches, and with him theory will necessarily supersede practice. Opportunities will be afforded such pupils to teach in the elementary classes, whereby greater efficiency will be acquired.

SPECIAL COURSE IN PAINTING.

Trees, Animals and Figures from copy and from nature, in Pencil, Charcoal, and Sepia; Aerial Perspective.

Anatomy of Expression; External muscular development; Shading from Statuary in Charcoal and Monochrome; Composition drawing from description; Memory Exercises.

Water-color Painting from pictures; Sketching from Nature in Sepia and Water colors; Copying from Oil Paintings of Portraits and Landscapes.

Sketching from Nature in Oil-colors; Rapid studies of interiors with varied arrangement of light and shade; Pictorial composition, introducing figures or animals: Theory and History of Art.

Portrait Painting from life; Pictures finished from sketches; Studying of Groups of Still Life subjects; Painting of ideal compositions of one or more heads; Chemistry of color.

ADVANCED COURSE IN DESIGNING.

Studies in Clay or Wax.

Ornaments and Plant form in Basso Relievo from flat examples; Designs adaptative to useful objects; The Human Figure from cast or original composition, reproduced by casting in metal or plaster; Process of manufacture; Monumental designs.

Shading from cast and from nature; classic objects and furniture enlarged from copy; Designs finished with Pen, Brush, and Distempera color; Architectural construction.

Design for Church Decoration in Historic Styles; Memorial Windows for stained glass; Decorative designs; Commemorating events in History; History of manufactures, and important inventions.

ADVANCED TEACHERS' COURSE.

A teacher must be prepared for emergencies for which the professional designer or artist has no experience. A general knowledge of the several subjects is therefore recommended. The decorative and painting courses will be worked together so as to form a thorough course for teachers.

The authorities of the University have provided that persons not connected with the institution may join the drawing and painting classes on very moderate terms.

MUSIC.

Music constitutés no part of any University course of studies, and is therefore not provided by the Trustees. But as many students, especially young ladies, desire instruction in music, competent teachers are selected by the Trustees, and rooms set apart for instruction.

COURSE OF INSTRUCTION.

Bertini's Instructor; Clementi's Sonatines, Op. 36, 37, 38; Heller's Studies, Op. 36, Books 1 and 2; Duvernay's Studies, Books 1, 2, 3; Loschhorn's Klavier-Technik: Czerny's Etudes de la Velocite, Op. 299, Books 1, 2, 3, 4; Czerny's Fifty Finishing Studies, Op. 740, Books 1, 2, 3; Cramer's Studies, Books 1, 2, 3. 4; Mendelssohn's Lieder ohne Worte; Clementi's Gradus ad Parnassum.

TUITION.

Instruction term of ten weeks—2 lessons a week	$10 00
For term of ten weeks—one lesson a week	6 00
Practice on piano, one hour daily, per term	2 00

MRS. ABBIE WILKINSON,

Teacher of Vocal Music and Voice Culture, follows the Italian method, giving individual instruction.

TERMS.

Ten weeks—two lessons a week	$12 00
Ten weeks—one lesson a week	7 00

No deductions on account of absence in either course, except in case of protracted illness.

Special students in music will also be charged the regular term fee charged other students of the University.

PAPERS TO ACCOMPANY REPORT.

I. What Work is Legitimate to the Institutions founded on the Congressional Grant of 1862.

By Dr. Peabody.

II. Experiment in Cattle Feeding.

By Professor Morrow.

III. Notes on Farm Machinery.

By Professor Morrow.

IV. Bacteria—their Nature and Effects.

By T. J. Burrill.

V. Report on the Manufacture of Sugar, etc., from Sorghum.

By Professors Weber and Scovell.

WHAT WORK IS LEGITIMATE TO THE INSTITUTIONS FOUNDED ON THE CONGRESSIONAL GRANT OF 1862.

By Selim H. Peabody, Ph.D., LL.D., *Regent.*

[Read at a Convention of Agriculturists, Washington, D. C., January 11th, 1882.]

The great exposition in London, in 1851, was the first of those gatherings in which the workmen of the world have competed for supremacy in those arts which mark the development of mankind in the nineteenth century. It proved to be a grand awakening of the thought of the nations, America included, to the fact that those peoples who had most faithfully fostered the advancement of scientific discovery, with its application to practical arts, were making the most rapid stride in every line of material progress. Especially was it apparent in America that there was an imperative demand for higher technical instruction in every direction of human art, enterprise, and labor; in agriculture, in engineering, in architecture, in mining, and in all departments of manufactures. In a few particulars we had demonstrated the wonderful versatility of the American mind, its ready adaptability to new circumstances amid untried conditions; its fertility of invention; its quickness of acquisition; its grasp and strength, and tireless activity. With this demonstration came also the conviction that the need of the time, the inexorable demand of the nation, was the need and the demand for technical instruction, such as could then be found nowhere on this side of the Atlantic. This leaven was fermenting in every thinking mind. A few schools were in operation. Efforts were everywhere made to open others. There was a school of engineering at Troy. There were scientific departments at Harvard, Yale, and Dartmouth. Pennsylvania and Michigan had founded schools of Agriculture. Other schools of applied science were contemplated. There was great difficulty in securing the endowments, without which such enterprises could not thrive. As the want to be supplied was of national extent, as the benefits to be secured were such as would increase the nation's wealth and develop the nation's prosperity, the idea was born—some say in Illinois—to seek aid of the nation at the hands of the Federal Government.

During President Buchanan's administration a bill was introduced into Congress by Mr. (now Senator) Morrill, of Vermont, which bill provided that a part of the public domain should be distributed to the several States for the foundation of schools in which technical instruction should be given. The bill was advocated before the House in an able speech by Mr. Morrill; was thoroughly discussed and

bitterly opposed in the Senate, and finally passed by a close vote, only to fail by reason of the veto of the President. During the first year of President Lincoln's administration the measure was again proposed; again passed both houses of Congress, and became a law on the 2nd of July, 1862. Nothing could have been more significant of the abiding faith which Congress then cherished as to the perpetuity of the Federal Government than the passage of this act in one of the darkest hours of the terrific struggle then going forward. No part of this act is more thoroughly familiar to each person who hears me, than that section which so briefly, so concisely, yet with such generous provision, such breadth of permission, describes and defines the purposes to which the funds donated in the act shall be devoted. Apparently, as clear as the day, as luminous as light, the interpretations given to this section are marvelously diverse, and often diametrically opposite. I had almost come to think the subject trite and its consideration needless, and yet the discussions of yesterday have led me to believe that even now it may be wise to pause, hunt up the statute, and see how reads the law.

"The leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

What may be done legitimately in carrying into operation the instructions of this law? As has been suggested, each person has his own interpretation, and I crave brief forbearance while I present mine.

First. The business of each institution resting on this grant is TO TEACH.

An institution of learning, especially of scientific learning, has usually a twofold function, namely, the acquisition of knowledge and its dissemination. Either function may predominate, or the two may be made co-ordinate and mutually helpful. If, however, I read this law rightly, the end it requires is instruction. While it permits, by inference, in another place, that effort may be expended in the acquisition of knowledge, this permission is only by inference, and the labor so employed should be such only as may be made directly useful in stimulating and broadening and assisting instruction. If it be possible to draw a line sharply and distinctively between a school for the instruction of students, in which their mental growth and their scientific training shall be the absorbing interest, and an experimental station, in which the development of science in and for itself shall be the chief business, then the institutions founded on this act should be schools, and not experimental stations. A purely experimental station, however essential to science, however useful to the general welfare, however practical in the results which it may procure, if it be divorced from the instruction of pupils, does not answer the spirit of the requirements of this law. If the experiments can be so conducted as to help the advancement of the student, to quicken his perception, to broaden

his judgment, to stimulate his energies, to illustrate the science in which he strives for the mastery, to assist even indirectly in the instruction which it is the real business of the institution to impart, then they are legitimate and should be fostered. The greater part of such experiments will not be found developing new science or breaking up new ground. The ground will be new to the pupil; the work will offer to him absorbing interest, because it is novel, and it will be imperatively needed by him either as teaching him how to conduct similar work in the future, or as illuminating the ground over which he must tread and with which he must be familiar before he can be fitted to enter upon fields wholly unexplored.

I dwell upon this point because it seems to have been assumed on one or two occasions, in our discussions, that if any institution, for want of opportunity, or of means, or because of other occupation, is not at work at some unsolved problem, and developing something new in science, it is therefore derelict in duty and is to be condemned as a failure. On the contrary, I believe that the time and strength of a professor, and in so far of an institution, may be so absorbed in that most interesting and fascinating employment, the pursuit of new science, and the solution of new problems, that he may neglect the more important duties of teaching the students who have been confided to his care. In most cases I apprehend that the conscientious teacher will find the time at his disposal all too short in which to conduct his pupil over the well-known ground of clearly established truth, and that the illumination which he can and must shed upon that truth will absorb all the means and time and strength at his disposal. His first and paramount duty is instruction. If his investigation will help his instruction, let him investigate; if it interferes with his instruction, let him obey the law and TEACH.

Second. What shall be taught?

With its wide latitude of permission, the law specifies but one subject which shall be taught, and that is military tactics. Possibly some of those who conduct the institutions in question would be glad if the act had been signed at its first passage, when this item was not included. Yet there may be grave question whether the schools would indeed be better if this requirement were omitted. The discipline, the physical culture, the development of manly vigor and gentlemanly bearing, the training in the use of arms and in the management of men, is worth, in my judgment, all it costs in a course of other study. The government, in all cases that I have known, has furnished the equipment when asked, and in most cases has detailed an instructor, free of cost, to the institution. I believe that good faith and simple honesty requires from every institution under this act, obedience to this item of the law, and that each student not physically incapacitated should be required to learn the manual of arms and the maneuvers and command of a company. The evasion of this law on the part of college governments is an unfortunate lesson to their students as to the doctrine and the duty of obedience.

But this item of military tactics is merely an incidental thing put into the act under the inspiration of the conflict which was raging

when the act became a law. The grand purpose of the enactment is stated in the words, "to teach such branches of learning as are related to agriculture and the mechanic arts * * * in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

What does this mean? Why, says my farming friend, that means agriculture. The agricultural press throughout the country proclaims that it means agriculture. It has been so urged by members of this convention. The bill was known during its first and second passage through Congress as the Agricultural College Bill. The institutions founded thereon are commonly called the agricultural colleges. There is a large body of people in the country who insist that these colleges (1) ought to teach agriculture; (2) ought to teach nothing but agriculture, and (3) that they do not teach agriculture. Those who adhere to either of these propositions are in error in some greater or less degree.

It is certain that agriculture, as a topic to be taught in these institutions, is a topic of first importance. The law so states and so intends. But with equal precision the law requires that instruction shall be given in subjects which pertain to "the mechanic arts," that the students thereof may be prepared to enter the "several pursuits and professions of life." The law uses the same emphasis and the same authority in specifying the one item, which it uses in stating the other. If the Massachusetts Institute of Technology, which enjoys a part of the income from the grant of 1862 to that State, errs in not teaching subjects which relate specifically to agriculture, the Massachusetts Agricultural College, which has the remainder of that income, errs just as grievously in that it does not teach subjects which relate specifically to the mechanic arts. But, nevertheless, the State of Massachusetts, having provided in these two institutions for instruction in both agriculture and the mechanic arts, fulfills her whole duty under the law. Her sons may choose the line of study which seems to them best suited to their capacities, their aspirations, or their hopes for gaining a livelihood. If, at Amherst, they have learned the principles and practice of agriculture, they have done well. If, at Boston, they have learned the theories and the arts which make them skillful mechanicians, they have also done well. The State will be benefited by the genius and the skill of either. If the requirements of the law may thus without doubt be satisfied by these separate institutions, these requirements may with equal fullness be satisfied by the conduct of two or more departments in the same institution. The graduate who leaves such a school is not to be blamed even if he has not learned agriculture. He is to receive credit for faithful study and useful acquisition if he has perfected himself in any technical learning which has promoted his liberal and practical education for any of the several pursuits and professions of life.

For the term "mechanic arts," in the light of its subsequent amplification and explanation, is not by any means to be restricted to the arts of devising, building and operating machinery, unquestionably included in that term. The art may be that of constructing the railway, as well as of building and running the locomotive that treads its iron track. It may erect the bridges that span the stream

that track crosses. It may and should include the designing and construction of the stations that make its termini; or of any other edifices that men need to use in business, or want to love as homes, or to admire as monuments of public munificence. The science of the chemist that may develop the art of the dyer, or the skill of the assayer and the metallurgist, or of the refiner of sugar, or of use in the thousand forms of usefulness to which chemistry reaches forth its helping hand; the science of the electrician that builds our telegraphs, or will illuminate our cities and brighten our homes; the art of the designer that lends beauty to the products of the loom, that shapes the clay of the potter into things of perrennial joy, that sheds its halo of delight over all things precious or commonplace, adding untold wealth to the crude products of rude mechanical toil—these, and a myriad more, in ways that science alone has opened and will open as the avenues to a livelihood or to a competency, are the lines of work that legitimately have place in the instruction of institutions of learning which the State has founded for the education of the industrial classes in the several pursuits and professions of life. Nay, more: unless the institutions in question do provide in some manner and to some extent for instruction that shall bear fruit in some of these ways, as well as in agriculture, they are delinquent in their duty towards the law which created them and towards the needs of the public for whose benefit they were and are founded, for it needs no argument before this body to show that the greater the number, and the more diversified the nature, of the industries which occupy the labor and skill of a people, the greater will be the prosperity of that people. It is no more fitting that all men shall be farmers, than that every farmer should raise only corn, or cotton, or hogs. When all farmers have learned how to make two blades of grass grow where but one grew before, there will not be occupation for as many grass-growing farmers as were required before that consummation had been reached.

It is true that these colleges, save as teaching may be divided as before indicated, are bound to teach agriculture. It is equally true that they are required to teach a wide curriculum of science and art beside agriculture. But it is said that they do not teach agriculture, and that they draw the sons of farmers away from agriculture, and teach them to despise labor. Most statements of this sort are based upon observation limited to individual cases, and so far as I am able to observe, lack breadth of information. From the earliest days of the republic, farmers' sons have turned their backs upon the farm to enter upon pursuits which required less manual toil. That the farm has furnished largely the fresh blood that has enriched the learned professions with strong and noble exemplars, has been the boast alike of the farmers and of the professions. From the farms went the Washingtons and Jeffersons, the Clays and Websters, the Lincolns and Garfields, whose renown has been the aureole about the brow of our nation of free laborers. Never have I heard that even the farmers have mourned because such men exchanged the labor of their hands for the severer and more exhaustful labor of their brains. But even these men have never lost their affection for the soil whence they sprung; when wearied with the conflicts of the arena, whether victors or vanquished, they

sought renewed vigor in the embracing arms of the dear mother who had nourished their sturdy youth.

It is sometimes asserted that enough of labor is not required at the hands of students, and that students who are not so made to work are not taught agriculture. If the work which can be put before students is something which develops manual skill, in which practice leads to perfection, in which brain has its part, then it is useful to the student, he loves it, and is always ready to attack it. Our American boys will always work when they can see the profit of it. They will not work kindly in school or after they leave school, at things which a dullard, or a brute, or a machine can do as well, and for the very sensible reason that they know it does not pay. The manual labor that is put regularly and systematically before the boys in one of the very best schools where this system prevails—work which was provided because no other was to be had—consisted mainly of such labor as spreading heaps of manure, chopping brush, digging potatoes and ditches, and other occupations of like drudgery, which most knew all about before they came to college, and which any of the others learned to do perfectly in the first hour's trial. That which the boy comes to college to learn is not that which he has already learned or can learn at home; he were foolish to go from home for such instruction. He goes to learn something which his farm work will not bring to his knowledge.

Nor is it true that these colleges educate the boys away from the farm or away from labor. Of the students who attend the Illinois Industrial University about 75 per cent. come from farmers' families; 80 per cent. are young men. About 55 per cent. choose technical courses, divided with considerable uniformity between agriculture, chemistry, architecture, mechanics, mining, and civil engineering. It rarely happens that a student leaves a technical course for a literary course, while it is a common occurrence that one who has witnessed the practical work about him, the fullness of experiment, and the interest it awakens, it is common that such a student turns from a literary to a technical course. Our paths lead toward science, rarely from science. Farmers' sons who come to us and enroll their names as taking other courses of study very frequently pursue some parts of the agricultural course, as collateral work, intending at the end of their college life to go back to the farm, so that it is now true that a much greater per cent. of our alumni are farmers, than the percentage of our students who are, or were, special students of agriculture.

As a rule, young men choose such course of study as they believe, from the best information in their possession, will lead them to immediate and lucrative employment. Especially is this true of students in technical schools. If young men could be brought to believe that trained agriculturists could command wages commensurate with the expense of the training, ten would undertake this course of discipline for one who now enters upon it. Such demand for educated farmers as has been described at this convention may exist; but such knowledge of it as will help intending graduates to find business after graduation, does not come to those who have charge of institutions, who would gladly bring employers and em-

ployés into communication. During the last year the officers of the institution I represent furnished fifteen to twenty assistants to engineers of lake and river surveys, and of railway lines, applying for such help. This year the engineering classes are crowded. There is a like demand for machinists and architects, and with like results. The same conditions do not exist for agriculturists.

The Illinois Industrial University offers a wide opportunity for choice of studies to those who knock at its portals. First and completist has been its equipment for agriculture. It has one hundred and fifty acres of land devoted entirely to experimental uses in agriculture, horticulture, aboriculture, orcharding, vineyards, small fruits, druggists' herbs, anything which may promise useful variety to tillers of the ground. It has a stock farm of 400 acres, on which students are shown the conduct of the business of raising crops and feeding cattle with a view to economy and profit, and this farm yields annually a fair remuneration to the treasury of the college. It keeps constantly from 150 to 200 head of cattle of all ages; some of gentle breeding, others of graded stock of various qualities and strains, by which to illustrate their relative value for profitable handling. It is well supplied with tools and implements that are carefully managed and tested. The department is under the charge of a professor (Prof. George E. Morrow), of whom I would gladly say more if he were not here present to object. We have yet to learn of his superior in the West. The professor of botany and horticulture is equally master of his specialties. Competent collateral instruction is fully provided.

The courses in agriculture are greatly varied. If a student can afford time for a complete course of four years, he will find every term thereof crowded with profitable work. If one year is all that he can give, a course of special technical work is arranged for him. If he would choose a course for himself, of greater or less length, the choice is limited only by his own advancement, or by the current programmes of the terms. If the winter term is one which he can spare from active labor on the farm, a series of lecture courses is open to him, for which no special preparation is required. Finally, in most years, a farmers' institute of one week is held in January, to which all farmers are invited. If there is any way in which agriculture can be offered by which it can be more attractive, or more profitable, or better adjusted to meet the wants of the recipient, we shall be glad to be advised of that way. Yet the fact remains that comparatively few students out of our whole number take a course of agricultural instruction in any of the forms mentioned. The truth is that our Illinois farmers cultivate a soil so fertile, so sure to honor their drafts, that they cannot abuse it so badly but it will give them always a support, and generally bountiful profits. These farmers cannot realize that agricultural education can increase their profits, or improve their situation.

I will not take space to detail the equipment of our university in other technical departments. Our laboratories and shops, the machine-shop, and the carpenter's shop, are full beyond our means of supplying room and tools. The young men are eager to work in these specialties. One year ago, through the liberality of the Secretary of State, a room in the State Capitol at Springfield, spacious,

elegant, and most conveniently situated, was placed at my disposal, in which was arranged an exhibit showing the products of students' work alone, all other being strictly excluded, which required two freight cars to transport from Champaign to Springfield. Each school of technical art was represented—agriculture and horticulture, with fruits and grains and wood and models. Chemistry, with a long list of chemical and pharmaceutical preparations, and an exhibit of sorghum products of great variety, and of good quality. Mechanism, with a complete set of its shop-practice objects, and a large collection of mechanical models, all made by student workmen. A like set of shop-practice objects from the carpenter-shop, with accurate models of roofs, bridges, stairs, and every form of joiner and cabinet work. Specimens of natural history, mounted with life-like grace and beauty, and drawings from all schools, conspicuous for accuracy, perfection and adaptation to useful art.

This university has passed the time of telling what it proposes to do and what it hopes to accomplish. It has entered upon the stage where it can show something which it has done; yet it is to be hoped, without being in any sense content to rest upon any laurels it may have won.

I have thus far spoken of the duty of the so-called agricultural colleges to furnish instruction in branches which may lay the foundation for a means of getting a living. But this is not the noblest function of an institution designed to train the young, whatever may be the practical end immediately sought. The first business of any school is to develop men. Those whom the honorable Commissioner (Mr. Loring) described to us yesterday as wanted, as in eager demand, a demand far beyond the supply, for agricultural employment as florists and gardeners and farm managers; those whom the distinguished gentleman from South Carolina (General Aiken) desired to transplant to his sunny fields as farm superintendents, were in every case to be men. Men of good brain, of good muscle, in full health and stalwart vigor, physically, mentally, morally. They must be men of fair culture, ready in business, in the market, in society, in the discharge of every duty as citizens, to meet and wrestle with the men who are trained in other schools and by other methods. A fatal error will have been committed if their training has been confined to the technical studies which, however useful they may be, are useful in only a narrow and limited scope. There must have been developed a power to think clearly and quickly; to reason logically; to express fluently and intelligibly the ideas which have been gathered in the school, or have germinated in their own minds. There is value in all the culture of finer grain which comes from any acquaintance with the humanities, with the thoughts of men who lived in other ages, and spake in other tongues. If there be any form of education that makes any man stronger and wiser and nobler, the farmer and the artisan, the machinist and the engineer, the architect and the designer, and especially he who in any capacity is to be the guide and director and controller of men, needs that culture, that education in its fullest extent.

And so it was that the man who drew this act under which our schools have the right of life and of maintenance, added that these

things which were specified, and which we have at some length discussed, should be done and taught "without excluding other scientific and classical studies." The technical studies are to be first provided for, but there shall be no prohibition or exclusion of other scientific subjects, or even of the classical studies which so many who affect to be practical, pretend to despise. Practical training is demanded, and liberal culture, as well, is to be cherished. If the farmer's boy tastes a little Latin, it will not harm him. Even if, as is rarely the case, he unearths a Greek root, phosphorescent with age, it will not destroy him. If the mechanic or the engineer, or the technical student in any specialty, would open the doors which look into French or German apartments in the temple of science, he will find there stored vast accumulations of precious learning in the very things which he most earnestly covets, which, possessed, will add vastly to his stores of knowledge, while the act of acquisition will give keener edge and quicker play to the weapons of his mental armory.

For every mind a discipline is needed, which comes from an acquaintance with other subjects than those pertaining to pure science, or to applied science, however useful those may be. The graduate of any higher school ought to know something of the laws of his own mental activity; something of the principles and methods of the government of which he is a part, and which, in some of its higher or lower departments, he may be called to administer; something of the laws of wealth and the great economies which govern production and distribution and consumption; something of the physical history of the world and of its relation to the rest of God's creation; something of the history of his own race, as it has lived on this earth, with the details of the grand march of history along the highway of nations; something of his own language and its literature, the thought, pregnant with power which the creative minds of his own and of elder days have produced, and which now, in many unrecognized but forceful influences, make up so much of the staple of our thinking and of our present culture. Never does the student gain all his acquisitions at the feet of his preceptors. The outlines only are there acquired; the impulse is received; preferences established, mental bent obtained; the development progresses while the thinking mind endures. But the doors into all these apartments of human knowledge, and to all these sources of higher culture, should have been opened to all young men and women that they may at least know what munificence of intellectual wealth lies within their reach, and these opportunities should be furnished in the technical, as well as in the literary or the classical school.

What is legitimate to the schools resting on the grant of 1862?

All forms of technical education, and in the wide scope of possibilities, every form of human learning which it has fallen to the fortune of mankind to devise or acquire.

NOTES ON FARM MACHINERY.

G. E. Morrow, *Professor of Agriculture.*

American farm implements and machinery deservedly take a high rank. Lacking the weight and strength of those of Great Britain, most classes of machinery used by American farmers are remarkably well adapted to the work to be done. The general use of improved machinery is one of the most striking features of American farming, especially in the West. Even in the Territories where farm settlements have been made within a year, there are to be found agricultural implement stores in which are exposed for sale implements and machines, in number, variety and excellence far beyond what was to be found in any country a half century ago. The work of inventors and manufacturers has brought several classes apparently near perfection, unless radical changes in form or principle be made. The best plows of to-day seem incapable of great improvement so long as an implement working on the principle of the plow is what is desired. Any one of a half dozen patents of self-binding harvesters is nearly as perfect as almost any class of machinery that can be named. Their workmanship seems coarse in comparison with that of a watch, for illustration; but, drawn by horses moving at irregular speed, over rough ground, these machines do all the different kinds of work asked of them with remarkable efficiency.

Of many classes of farm machinery there are many styles of almost equal value. A farmer need not trouble himself much in purchasing plows, reapers, mowers, etc. etc., for any one of a dozen or score of manufactories can supply him with a machine which will do nearly as good work as any other one. In minor points one will surpass another, but in essentials, there is little room for choice.

The excellence and abundance of farm machinery is not without its dangers to the farmer. To stubbornly cling to old styles, refusing to make use of recent inventions and improvements, is a fault of some farmers, but there are many cases in which the opposite extreme is to be found. Unless provided with abundant means, the farmer cannot afford to purchase all the "good things" offered him. The question of what and how much machinery to buy, is one which may often puzzle the farmer. Before deciding to buy it should be clearly decided whether the machine will do the work needed to be done; whether it will do it better, or more cheaply, or more quickly than it can be done by means already at hand, and whether the gain in any one of these points will repay the cost of the machine.

On small farms, or on large farms where but little of a given class of work is required, it is often better economy to hire the work done, or do it even by primitive means, rather than buy improved machines. A mowing machine is a great labor saver, but the purchase of one is not wise if there be but a half dozen acres of grass to cut. The use of old and inefficient tools is to be discouraged, but sometimes the old machine will accomplish the work nearly as well as a new and much more costly one. When a purchase is to be made the advice to "get the best" is generally sound; but it does not follow that it is wise to discard the old because a better can be obtained.

Of two machines designed to do the same class of work, the simpler, stronger, more easily adjusted, is to be preferred in a large majority of cases, even if there be some admitted advantages in the more complicated machine. Every movable part in a machine probably increases the danger of breakage. Complicated arrangements adjusting farm machinery should usually be avoided. The average farm laborer is not an especially intelligent person, and is certainly not a trained machinist.

In a majority of cases purchasing machinery of established reputation is much safer than investing in newly introduced kinds even though they seem to possess advantages. Experimenting and trial is every way commendable, and some must do this if we are to have improvements; but a farmer of limited means can no more wisely make a practice of buying all the promising newly-invented machinery than can a poor student buy all the new books he finds commended to his attention.

In some classes of farm machinery prices are higher than they should be; in many, however, the competition between manufacturers has brought the prices as low as can reasonably be expected. Sometimes the apparent reasonableness of price is accompanied by poor workmanship or poor material. In the case of most patented articles of farm machinery the prices charged for "repairs" can only be classed as outrageously exorbitant. In some cases the prices for the separate parts aggregate a half dozen times the cost of the complete machine.

While manufacturers are not free from blame in all cases, it often is true that complaints of failure to perform work satisfactorily or of breakages arise from improper usage on the part of the owner. Implements are often put to work for which they are not fitted; their strength over-taxed, or direct carelessness results in breakage. Much has been said concerning the proper care of implements, yet the cases in which they are most improperly neglected are still common.

Chicago Screw Pulverizer.—One of these awkward-looking machines has been in use two years, and has given good satisfaction in many respects. It has been used in preparing land for and sowing rye and oats and in preparing land for corn; for each crop being used both without previous plowing and following such plowing. Good crops have followed its use. The seeder has worked well; apparently as well as any broadcast seeder could be expected to work. For working over fall plowing we have found it do excellent work. The disadvantages of the machine are that its cost, over $200, and

the fact that four horses are needed, make it adapted only to large farms. It is heavy to handle; is not suited for working in small fields, on hilly or stony or stumpy ground; nor when the ground is at all wet. It will not work well when there is much grass, stubble or weeds on the surface. The cultivators made from it do good work in corn; but, especially in weedy ground, the tendency is to ridge the ground more than desirable. When run deep, the land is left ridged more or less, sometimes objectionably so. Thus, while its purchase for the University farms was not unadvisable, it would be a great mistake for the average "small farmer" to invest in one. It will not enable him to dispense with the plow, and for many purposes other and less costly implements will answer perhaps equally as well.

For six years past there has been on one of the University barns a large *windmill*, used for grinding grains, shelling corn, cutting hay, straw or corn stalks. It is a good mill; has stood well, and almost without repairs. With a fair wind it gives sufficient power for any of the uses specified. Yet it is not certain that a similar mill should be recommended for even large farms generally. It frequently happens that when needed there is not sufficient wind; it is costly, and farmers may secure either tread or sweep powers to be worked by the horses necessarily kept on the farm, at less cost. One advantage of the latter class of powers is that they can easily be moved from place to place. A two-horse tread power has recently been purchased, and, while it has disadvantages, it is working well so far as tested, and has the great advantage of being suited for working where there is not sufficient room for the use of sweep powers.

For two or three years we have been using a McCormick wire binder. It does good work, and can do much more. There are some advantages in the use of twine binders; but these do not seem sufficient to make it best to discard this machine and purchase another. With reference to the commonly made objection that stock will be injured by eating the wire left in the straw at threshing, it is to be said that we have seen no injury either to horses or cattle, although timothy straw as well as oat straw, so bound, has been freely used.

We are using walking plows of three different makers in this State, and it would be hard to find a reason for giving any decided preference to any one over the others, either in quality or work done, or draft. We are using, and like well, the Gilpin Riding Plow. The fact that it has one lever instead of two, as have most riding plows, is one point counted in its favor. We have tried the Cassady plow, and were much pleased with its work, dispensing with the "landside," which doubtless reduces the draft, and the inclination of the wheel in the furrow seems to admirably regulate width of furrow and prevent pressure against the landside. The arrangements for adjusting, to regulate any possible condition, are complete—possibly more numerous than some who use the plow will make good use of.

In filling a silo recently, a feed-cutter of good size, and which had done good work, was made use of. The large corn stalks and the larger ears, far from mature though they were, proved too great

a strain, and a breakage was the result, through no fault of the machine, but because it was asked to do more than it was fitted for.

Of farm machinery for which there is demand as yet unsupplied, may be named a field corn-husker; a harvester for corn stalks; a ditch-digging and tile-laying machine. Ingenious and partially successful attempts have been made in each of these directions, but success has not been attained.

A CATTLE FEEDING EXPERIMENT.

G. E. MORROW, M. A., *Professor of Agriculture.*

In the spring of 1880 an attempt was made to purchase a pair of yearling steers of each of the breeds kept in the State, for the purpose of comparing their progress under the same treatment—that approximating the treatment given cattle by the mass of farmers.

J. Patterson, of Rock Falls, furnished a pair of full blood but unregistered Ayrshires, sired by a somewhat noted show bull. The steers were of good form, but not large for age. Gen. L. F. Ross, of Avon, furnished a pair of good high grade Devons, sired by bulls in use in his well-known herd. Messrs. E. O. & E. E. Chester, of Champaign, furnished a pair of Short-horns, one pure bred, the other three-fourths. They were sired by a good but plainly bred bull of medium size, and were out of fairly good cows. Difficulty was found in securing Herefords. The only ones found were a pair of half bloods, bred by Messrs. Burnham & Son, of Martinton. They were out of common cows. They differed much in age. The younger one was counted much the better animal. None of the cattle were in high flesh, the grade Short-horns being in the best condition. Thanks are due the breeders for selling at reasonable prices—the Hereford grades being valued highest.

May 1, 1880, one of each pair was placed on pasture, with light feeding of corn meal; the others were kept on pasture alone. The season was not favorable for grass, and the pasture on which the first lot was kept was not good. At the first of November, all were turned in the corn stalk fields for a few weeks; then kept in open yards with threshed timothy hay, oat straw, and a very little ear corn—the design being to give a fair sample of allowing cattle to "rough it" during the winter. The winter was a severe one for cattle so exposed, there being a number of violent storms and much disagreeable weather.

May 1st, the cattle were put on pasture, and feeding ear corn twice a day began, commencing with about one-fourth bushel each per day, and increasing to almost a half bushel at the last. The summer was almost unprecedentedly dry and warm. Pastures

failed; the water supply was unsatisfactory. During the hot weather the steers had access, during the day, to a dark shed. During August the younger Ayrshire steer met with an accident which made it necessary to kill him.

The seven steers were taken to the Fat Stock Show in Chicago, in November. During the week they were sold to a prominent butcher of the city and were slaughtered in the building, the weights of different parts being taken. By invitation a committee of butchers informally classed the carcases in order of merit.

In tables below are given the names, ages and weights of the steers at different dates; also the results of the slaughter test. The second steer of each pair, as given in the first table, is the one which had some grain during the first summer:

Name.	Breed.	Birth.	Weight May 1...	Weight July 1...	Weight Sept. 1..	Weight Nov. 1...	Gain in 6 months.	Weight May 1...	Weight Aug. 1..	Weight Sept. 1..	Weight Nov. 10..	Gain in 6 months.
1.—Jock.....	Ayrshire.....	Feb. 3, '79...	605	770	820	885	280	920	1,200	1,215	1,305	385
2.—Jo.	Ayrshire.....	March 1, '79.	565	715	720	780	215	765	990			
3.—Thomas.	⅞ Devon.....	March 1, '79.	490	690	780	830	350	850	1,160	1,145	1,300	450
4.—M'y D'ke	⅞ Devon.....	May 1, '79...	495	635	660	710	215	800	1,070	1,125	1,215	415
5.—Burnh'm	½ Hereford..	Oct. 1, '78....	755	990	1,065	1,175	420	1,190	1,550	1,595	1,670	480
6.—Junior..	½ Hereford..	Aug. 20, '79..	540	690	740	750	210	840	1,175	1,220	1,335	490
7.—Ezra.....	Short Horn..	April 1, '79..	635	880	900	990	355	1,100	1,400	1,420	1,500	400
8.—Oscar...	¾ Short Horn.	March 1, '79.	725	845	865	960	235	915	1,260	1,335	1,430	515
Totals.....	.....	.....	4,810	6,215	6,550	7,080	2,280	7,380				3,135

Name.	Merit of carcase.....	Weight at home.....	Live weight at slaughter.....	Weight dressed carcase.....	Weight carcase—hide and tallow.....	Tallow	Hide.....	Left fore quarter.....	Right fore quarter.....	Left hind quarter.....	Right hind quarter...	Head.....	Feet.....	Paunch and guts.....	Liver, heart, tongue, lungs, trimmings....	Blood .....
Jock	2	1,305	1,220	733	886	71	82	192	194	173	174	27½	16	173	44½	34
Thomas.....	4	1,300	1,175	707	846½	56½	83	188	186	167	166	31½	17	174	35½	34
May Duke	3	1,215	1,135	677	808	55	76	182	183	156	156	30½	14½	172	33	33
Burnham	7	1,670	1,545	965	1,151	88	98	255	255	228	227	35½	21½	207	42	35
Junior	6	1,335	1,250	750	894	56	88	197	198	179	176	30	19	197	40	33½
Oscar,.....	5	1,430	1,300	815	960	58	87	212	208	198	197	28½	19	181	41	31
Ezra.....	1	1,500	1,400	880	1,046	76	90	232	235	207	206	32	20	208	45½	41

Among the points suggested by these results may be named:

1. In no sense can this be counted a conclusive comparison of breeds; it is obviously unfair to compare half-bloods with pure bred animals. So far as the opinion of the butchers who examined the carcases has value, it goes to show that the greater the proportion of "improved blood," the better the carcase. The two pure bred steers stand at the head; the two half-bloods at the foot of the list.

2. The percentage of weight of dressed carcase to live weight shows the fact that none of the steers were very fat. These per-

centages range from 59 to nearly 63; they are all creditable. It was the general opinion of those who examined the carcases that they were as profitable to the butcher, and more profitable to the consumer, than were any of those of much fatter animals slaughtered, as the latter had too large a proportion of fat.

3. The shrinkage from full home weight to that after being shipped and fasted, is greater than many persons would have expected, ranging from 80 to 130 pounds, and averaging 104 pounds. "Full weight" is a somewhat unsatisfactory thing, as one animal may have drank much more or more recently than another.

4. The weights taken the first six months show that no one of the steers having some grain made as much growth as did his mate on better pasture without grain. In both years but little gain was made during the hot, dry weather of mid-summer. The fluctuations in gain are not always easily explained. This case furnishes further evidence, if this be needed, that the practice of keeping young stock through the winter in open yards and with little or no grain, is not profitable. Two of the steers lost in weight from November to May, and the total gain of the eight during these six months was only 300 pounds; the average gain per steer during the first summer was 285 pounds; during the second summer, 448 pounds, or a little less than 75 pounds per month; the largest gain in this time was 515 pounds, or nearly 86 pounds per month. These gains are not so large as should be expected in profitable feeding.

The table giving the weights of the different portions of the several carcases may be studied with profit. The task of cutting up the carcases was executed with unusual skill. It will be noticed that there is only the slightest variation in the weight of the pairs of quarters.

REPORT ON THE MANUFACTURE ON SUGAR, SYRUP AND GLUCOSE FROM SORGHUM.

BASED UPON EXPERIMENTS MADE IN 1880 AND 1881, AT THE ILLINOIS INDUSTRIAL UNIVERSITY.

By Henry A. Weber, Ph. D., *Professor of Chemistry*,
And Meville A. Scovell, M. S., *Professor of Agricultural Chemistry.*

[A portion of this paper was published in the Report of the Trustees for the year 1880, but as it forms the basis of the later work now presented, the whole is included.]

INTRODUCTION.

The object of the investigations made upon sorghum cane at the Illinois Industrial University, was to settle, if possible, the much disputed question, whether sugar could be made from this plant on a manufacturing scale and with commercial success. From the many conflicting reports relating to this matter no definite conclusions could be drawn, and it was found necessary, in order to prosecute our work in an intelligent manner, to treat the whole subject as an entirely new field of investigation. It has been claimed by many that the proper sphere of the sorghum industry is the production of syrup, and a great deal of good work has been accomplished in improving the quality and yield of this article; but what may have been true for sorghum a few years ago, does not hold good to-day. The sorghum industry is, at the present time, confronted by another, namely, the glucose industry, which, although still in its infancy, has already shown its superiority in the production of syrup, both in regard to quality and quantity. This

statement is made with due consideration of the many attacks which the glucose industry has of late received. Glucose, as an article of food, is equal to if not superior to cane sugar, and its artificial production from corn or other amylaceous substances, is a perfectly legitimate business. It is true, that in the decolorization of the glucose injurious substances may be employed, and if the products sent to market are not perfectly free from them, great injury may be done to the consumers. The same thing may be said for the refining of cane sugar. But in either case the employment of injurious substances is not a necessity, and should be condemned by every one who is interested in public welfare. Glucose, when made as it should be, is perfectly harmless, and no valid objection can be made to it in a sanitary point of view, when employed for any legitimate purpose to which it is adapted. The sorghum industry must regard the manufacture of glucose as a fair competitor, and the latter will never lose in importance by any unjustifiable attacks or criticisms. From these considerations it seems evident that the production of syrup alone can no longer maintain the cultivation of sorghum on a scale which would suffice to give it the name of an industry.

To accomplish this, sorghum growers should turn all their attention and energy to the production of crystallizable sugar, which glucose, on account of its inherent properties, can never replace, and which will always find a ready market free from all competition.

These circumstances led to the investigations about to be described, and the results obtained have exceeded our most sanguine expectations. Our experiments, both scientific and practical, have shown beyond a doubt, not only that the manufacture of sugar from sorghum in our own State is practicable, but also that it will be highly remunerative, when undertaken on a large scale.

Up to the present time sorghum seed has never found a proper utilization. Although in its general composition it resembles other grain as corn, the amount of tannin contained in it, as our analysis given farther on shows, will no doubt prevent its liberal use as food for animals. Knowing that immense quantities of seed will necessarily be produced as soon as the sorgum sugar industry is introduced, we have given this matter careful study, and have found that the seed is eminently adapted for the production of glucose. We have prepared the glucose directly from the ground seed, without the tedious and expensive process of first separating the starch. The great advantage of this industry to the sorghum industry will appear from the fact, that as the seed is practically ripe when the cane is cut it can be stored up till the sugar season is over, and can afterwards be manufactured into glucose with the same machinery now used in making sugar from the cane, thus giving employment for the balance of the year to the works, which otherwise would have to lie idle for eight or ten months annually.

Our work occupied two distinct fields of experiments: first, scientific investigations, in which the nature of sorghum cane was studied; second, practical experiments in making sugar.

PERIODICAL EXAMINATION OF THE CANES FOR SUGAR.

The objects of these analyses were:

1. To note the development and changes of the sugars in the plant during its growth.

2. To notice the changes which the cane undergoes after reaching this maximum stage in the quality and quantity of its saccharine matter: first, while standing in the field untouched; second, standing stripped two weeks; third, cut and lying under shelter.

3. To ascertain the portion of the stalk richest in sugar.

4. To study the effect of different varieties of soils on the development of sugar in the cane.

5. To determine the effect of freshly manured soils on the development of sugar in sorghum.

6. To compare the different varieties of sorghum as sugar producing plants.

These examinations were conducted in the following manner: On the dates specified, ten average stalks were selected from the given field, stripped, topped just below the uppermost leaf, and cut off one joint above ground. The stripped and topped cane was crushed in a thoroughly cleansed Victor mill. The juice was collected in a bottle and after being cooled down to 20° c., the sp. gr. was noted, then 10 c.c. were put into a graduated cylinder for the estimation of grape sugar, and 10 c.c. were put in a beaker for determining the amount of cane sugar.

For the estimation of grape sugar the 10 c.c. measured off for this purpose were diluted so as to measure exactly 100 c.c. and the grape sugar then determined by Fehling's solution.

The portion reserved for cane sugar was diluted, 12 drops of dilute sulphuric acid added, and the whole heated over a water bath for one hour. The mixture was then allowed to cool, sodium hydroxide added to alkaline reaction, diluted to 500 c c., and the total amount of sugar determined with Fehling's solution. The difference between the grape and total sugar was estimated as cane sugar by multiplying by 0.95.

The results of the analyses are given in the tables which follow:

TABLE SHOWING THE DEVELOPMENT AND CHANGE OF SUGARS IN SORGHUM.

Stage of Development.	No.	Date.	Variety.	Sp. gr. of Juice.	Grape Sugar.	Cane Sugar.	Av. of Cane Sugar.
Beginning to head	1	Aug. 14, '80.	Orange	1.055	5.70	4.90	4.14
	2	Aug. 10, '81.	Amber	1.058	8.39	3.38	
In blossom	3	Aug. 25, '80.	Orange	1.062	6.10	7.12	7.77
	4	Aug. 10, '81.	Amber	1.066	5.43	8.42	
Seed soft and milky	5	Aug. 14, '80.	Amber	1.065	3.34	10.75	8.56
	6	Sept. 6, '80.	Orange	1.068	5.00	9.13	
	7	Aug. 10, '81.	Amber	1.068	4.25	9.84	
	8	Aug. 12, '81.	Amber	1.070	3.75	12.75	
	9	Sept. 1, '81.	Orange	1.048	6.11	3.71	
	10	Sept. 2, '81.	Orange	1.048	6.58	5.19	
Seed in hardening dough	11	Aug. 25, '80.	Amber	1.068	2.47	12 48	11.95
	12	Sept. 16, '80.	Orange	1.065	4.11	9.76	
	13	Aug. 10, '81.	Amber	1.074	3.65	10.10	
	14	Aug. 12, '81.	Amber	1.074	2.65	13.37	
	15	Aug. 16, '81.	Amber	1.070	3.92	11.89	
	16	Aug. 16, '81.	Amber	1,072	3.00	13.66	
	17	Aug. 19, '81.	Amber	1.067	3.46	12.49	
	18	Aug. 19, '81.	Amber	1.074	3.10	13.18	
	19	Aug. 19, '81.	Amber	1.076	2.97	13.64	
	20	Aug. 19, '81.	Amber	1.070	2.98	12.80	
	21	Aug. 19, '81.	Amber	1.070	3.26	12.52	
	22	Sept. 1, '81.	Liberian	1.060	3.67	10.24	
	23	Sept. 1, '81.	Amber	1.063	2.61	13.47	
	24	Sept. 1, '81.	Amber	1.056	2.18	11.14	
	25	Sept. 1, '81.	Chinese	1.052	4.13	8.60	
Seed ripe	26	Sept. 6, '80.	Amber	1.064	2.13	11.42	11.18
	27	Sept. 16, '80.	Amber	1.065	2.79	11.02	
	28	Oct. 2, '80.	Amber	1.069	2.47	10.06	
	29	Oct. 6, '80.	Orange	1.078	4.02	11.41	
	30	Sept. 9, '81.	I. I. U	1.070	2.93	12.48	
	31	Sept. 1, '81.	Amber	1.070	2.71	10.77	
	32	Sept. 2, '81.	Amber	1.070	2.61	10.57	
	33	Sept. 5, '81.	Amber	1.067	3.16	11.76	

The analyses made in 1880, numbers 1, 3, 5, 6, 11, 12, 26, 27, 28, and 29, were from cane grown upon the University farm.

The following data in regard to the planting and cultivation of the cane were furnished by G. E. Morrow, Professor of Agriculture:

Two varieties, Orange and Early Amber; seed obtained from Hedges, St. Louis; planted by hand, May 14, 1880. The Orange was planted in a plot of nearly one acre (.955) in 24 rows four feet apart, in hills about four feet in a row. The Early Amber was planted in a plot of one and one-half acres (1.48) in 40 rows three and one-half feet apart, and with hills about same distance apart. Each plot was on good prairie soil which had been in corn two years, following a liberal application of barn-yard manure. The plots received ordinary field culture—a two-horse corn cultivator,—except hand-hoeing and thinning to four or five stalks when ten to twelve inches high. The suckers were not removed. The Orange averaged about seven feet in height, and over an inch in diameter at base. The Early Amber averaged over nine feet in height, and

rather less than three-quarters of an inch in diameter at base. The canes were cut about six inches from the ground. Of the Orange, from two to three feet of the top was taken off; of the Early Amber, rather more than three feet.

An analysis was made of the soil on which these two varieties of cane grew, and also of its subsoil and of a virgin prairie soil adjoining.

The following table gives the result of these analyses. No. 1 was prairie soil, No. 2 the soil on which the cane grew, No. 3 its subsoil:

Soil.	No. 1.		No. 2.		No. 3.	
Organic matter	1.9414		2.4880		3.7551	
Silicic acid	0.0798		0.0617		0.0975	
Sesquioxide of iron	1.8367		1.4517		1.2650	
Alumina	1.4775		0.5700		1.7150	
Manganese	0.1798		0.2200			
Phosphate of lime	0.1683		0.2103		0.1152	
Carbonate of lime	0.3835		0.5845		1.2515	
Carbonate of magnesia	0.5244		0.6757		0.7140	
Potash	0 0733		0.0785		0.0505	
Soda	0.0177		0.0211		0.0970	
Sulphuric acid	0.1403		0.1519		0.2137	
Soluble matter found		6.8327		7.5134		9.2745
Organic matter	4.1150		6.0700		8.9549	
Silicic acid	72.1765		68.7127		68.0224	
Alumina with trace of iron	12.7143		12 0520		9.3156	
Lime	0.5729		0.7721		0.6444	
Magnesia	0.4893		0.4831		0.4836	
Potash	3.0041		3.0331		2.4561	
Soda	0.5120		0.6344		0.5664	
Manganese	0.0093		0.0847			
Phosphoric acid	0.1933		0 1553		0.2628	
Insoluble matter found		92.7867		91.9974		90.7062
	99.6194	99.6194	99.5108	99.5108	99.9807	99.9807

Analyses Nos. 2, 4, 7, and 13, were made from cane grown upon the farm of Mr. J. W. Cushman, two miles south of Urbana. The field on which this cane was planted had grown seven consecutive crops of sorghum, without manure. It was high prairie land sloping towards the south. Seed planted April 25.

The cane of Nos. 8 and 14 was grown about one and one-half miles northeast of Urbana, on timber land. The field had been used as a barn-yard previous to its being planted with cane and was therefore richly manured. The seed came from Minnesota through Mr. LeDuc, ex-Commissioner of Agriculture. The seed was planted the first week in May. Cultivated as usual for corn.

Results Nos. 15 and 16 were obtained from cane grown three miles south of Champaign, on virgin prairie. Eight rows were planted along the roadside, bounded on the outer side by the road itself, and the inner by a tall, dense hedge-fence. Mr. Holmes, the owner of the cane, said the seed came from Mississippi, and was planted the last week in April. Land gradually rising from a slough near by. Two varieties of heads were present in this cane: the panicles of one (analysis No. 15) were clustered and erect; those of the other (No. 16) were spreading with pedicels drooping.

No. 21. University farm. Volunteer cane, from cane grown on the field last year.

The cane from which analyses Nos. 17, 18, 19 and 20 were made, was grown upon timber land about three miles N. E. of Urbana. The seed probably came from Minnesota.

No. 17. Cane grown by Mr. E. Bishop. Field ten years in cultivation, manured three or four years ago. Seed planted about the middle of May. Rows 3½ feet apart in hills 3 feet apart. An average of eight stalks in a hill. Cane small.

Nos. 18 and 19, cane grown by Christ. Shuman. No. 18 was on high land, twelve years in cultivation, and had never been matured. An average of five stalks in a hill. Growth of cane medium. No. 19 was on low land, four years in cultivation. Average of eight stalks in a hill. Cane large and thrifty.

No. 20. Cane grown by Sam'l Wilson, on land four years in cultivation. Hills 3x3½ feet apart. An average of eight stalks in a hill. Field on the top of a small hill.

Analyses Nos. 9, 10, 22, 31 and 32 were made in Macoupin county, Illinois, Nos. 9, 22 and 31 from cane raised about two miles north of Virden, by Mr. Chas. Rauch, and Nos. 10 and 32 one mile west of Girard, by Mr. D. C. Ashbaugh. The prairie soil in this county is very black, deep, and "mucky." No. 9. Cane grown on timber land. Seed planted May 12, 1881. Hills 3 by 3, an average of five stalks in a hill. No. 22. Volunteer cane. Prairie land. No. 31. Prairie land. Seed planted first part of May. No. 32. Prairie land; seed planted latter part of May.

The results of experiment No. 53 were obtained from cane grown by Christ. Lust, about a mile west of Monticello, Piatt county. The field was timber land—a poor, clayey soil. Seed planted first week in May.

Analyses Nos. 23, 24 and 25 were made of the juice of sorghum grown upon the so-called Mississippi sand-lands near Oquawka, Illinois. No. 23 was from cane grown by Dr. Park, one mile east of Oquawka. Nos. 24 and 25 were made from cane grown by Tom Ricketts, two miles N. E. of the same place.

Development of sugar. Analyses Nos. 5, 11, 26, 27 and 28 were made from the same field on the dates specified, and show conclusively that the cane sugar reached its maximum quantity when the seed was in the "hardening dough," and that it afterwards gradually diminished. The same fact appears on comparing the average under each division in the table.

Effect of stripping and allowing to stand. On October 2d, 1880, an analysis was made of the juice of cane, which had been stripped on the 18th of September—the cane not otherwise disturbed,—with the following result:

Specific gravity of juice	1.074
Grape sugar	1.82 per cent.
Cane sugar	13.11 " "

This subject needs further investigation.

Change of sugar after cutting the cane. On October 23, 1880, an analysis was made of the juice of the Orange cane which had been cut, stripped, and topped October 2d and placed under shelter until examined. Juice whitish.

Specific gravity	1.091
Grape sugar	14.66 per cent.
Cane sugar	3.55 " "

A sample of cane, cut August 25, 1880, without being stripped and topped, was preserved in a warm room where it had become dry long before it was examined. On April 3, 1881, it was analyzed and showed 12 per cent. of grape sugar and no trace of cane sugar.

Comparison of the upper and lower half of the cane. The two following analyses were made to show what part of the cane is richest in sugar:

Amber—October 2, 1880. Juice obtained from the upper half of the stalks after topping as usual.

Specific gravity	1.069
Grape sugar	2.94 per cent.
Cane sugar	9.67 " "

Amber—October 2, 1880. Juice obtained from the lower half of stalks.

Specific gravity	1.070
Grape sugar	1.94 per cent.
Cane sugar	11.64 " "

Effect of Soils. The following analysis were made to study the effect of different varieties of soil upon the production of sugar in sorghum. But as other circumstances, as locality from which seed was obtained, time of planting, and manner of cultivation, may affect the amount of sugar, many more investigations would have to be made before definite conclusions could be reached. The table, however, shows that sorghum can be grown successfully on all varieties of soil specified.

Table showing the effects of different soils on the development of sugar in sorghum:

Variety of Soil.	No.	Years in Cultivat'n.	Fertilization.	Variety of Cane.	Sp. gr. of Juice.	Grape Sugar.	Cane Sugar.	Average.
Prairie.	1	27	Manured 3 y's ago	Amber.	1.008	2.47	12.48	Grape. 2.94
	2	7	No manure.	Amber.	1.074	3.65	10.10	
	3	27	Manured 4 y's ago	Amber.	1.070	3.26	12.52	Cane. 11.28
	4	Unknown.	No manure.	Amber.	1.07	2.71	10 77	
	5	Very old.	No manure.	Amber.	1.07	2.61	10.51	
Virgin prairie.	6		No manure.	Amber.	1.07	3.92	11.89	Grape. 3.46
	7		No manure.	Amber.	1.072	3.00	13.65	Cane. 12.77
Timber land.	8	Unknown.	Barn-y'd manure	Amber.	1.074	2.65	13.37	
	9	10	Manured 4 y's ago	Amber.	1.067	3.46	12.49	Grape.
	10	12	No manure.	Amber.	1.074	3.10	13.18	3.07
	11	4	No manure.	Amber.	1.076	2.97	13.64	Cane.
	12	4	No manure.	Amber.	1.07	2.98	12.80	12.87
	13	Many.	No manure.	Amber.	1.066	3.16	11.76	
Mississippi sand land.	14			Amber.	1.063	2.61	13.47	Grape. 2.39
	15			Amber.	1.056	2.18	11.14	Cane. 12.3

Effect of Manure.—To ascertain the effect of manure a field was selected which had been used as a barn-yard for several years. A part of the cane was planted directly on the rotten manure pile. An analysis was made of a sample taken from this part of the field, as well as of a part away from a manure pile. The seed in each case was in the "hardening dough." The following is the result of the analysis:

Manured—Sp. gr. 1.063. Grape sugar 2.65. Cane sugar 10.89.
Unmanured " 1.074. " " 2.65. " " 13.37.

Variety of Cane.—From the table it appears that the Amber is best adapted for the production of cane sugar. The Orange and Liberian can also be employed advantageously in the latter part of the season, as they mature later. Their yield is greater per acre, and this fact would no doubt compensate for the less proportion of cane sugar to grape sugar contained in them. Analysis No. 25 of the Chinese cane seems to indicate that it would be unfit for the production of crystallizable sugar.

PROXIMATE ANALYSIS OF SORGHUM CANE.

An average portion of the Orange cut at the same time—October 6, as that used in experiment 29 was reserved, with tops and leaves still remaining, for analysis.

The leaves and two feet of tops were removed, and cross sections taken between each joint of the remainder of the stalks. The proximate principles were then determined according to the following scheme. The sections, as soon as cut, were weighed and then dried in a water oven, allowed to cool in the air, weighed, finally pulver-

ized, and put in a stoppered bottle. Of the dried substance, ten grams were required for sugar, fiber, starch, gum and vegetable acids; one gram for hygroscopic water and ash; one gram for total albuminoids; five grams for oil. The gram of dried cane reserved for water and ash was heated in an oven at 110° C. until its weight was constant. It was then ignited and the ash weighed. The ten grams for the estimation of sugar, etc., were macerated with water in a mortar, the water decanted, and this process continued several times, the decanted liquids being filtered by Bunsen's method, and finally the residue was thrown on the filter and washed until the filtrate measured one litre. 100 c.c. of this solution was evaporated nearly to dryness on a water-bath, then the desiccation completed by passing a current of dry air upon the residue by means of an aspirator, the temperature of the substance ranging in the meantime between 90° and 100° C. The residue was then weighed, incinerated, and weight of ash noted.

Albuminoids.—400 c.c. of the aqueous extract were evaporated to a syrup on the water-bath, calcined gypsum added, the whole then dried and the residue ignited with soda lime.

500 c.c. of the aqueous extract were rapidly evaporated nearly to dryness, and the residue exhausted with alcohol of 87 per cent. by repeated boilings with fresh portions of the solvent as long as it was colored. The liquids were filtered, the residue thrown upon the filter and washed with hot alcohol, and the washings added to the filtrate. Water was added to the filtrate, the alcohol expelled by heat, and then the solution diluted to 200 c.c.

Grape Sugar.—100 c.c. of this solution were reserved for the estimation of grape sugar. The remainder was acidulated with dilute sulphuric acid, and boiled to convert the cane into grape sugar.

Cane Sugar.—The cane sugar was then estimated with Fehling's solution, as usual.

Gum and Vegetable Acids.—The residue insoluble in alcohol was dried at 100° C., weighed and then incinerated. This ash and the soluble albuminoids were subtracted from the total amount of residue, and the remainder estimated as gum and vegetable acids.

The residue left after extracting the ten grams of cane with water was washed with alcohol acidulated with sulphuric acid to dissolve the albuminoids, transferred to a beaker, and diluted to 200 c.c. 5 c.c. of normal sulphuric acid were added, and the whole boiled for an hour on the water-bath, then filtered through Bunsen's filter. The filter was also cut into shreds and boiled with water containing one per cent. of sulphuric acid, to dissolve any starch remaining on it. After filtering, the two filtrates were added, and the starch estimated from an alliquot portion by conversion into glucose.

The method was as follows: The starch solution was diluted to 500 c.c. Three separate portions of 50 c.c. each were transferred to prescription bottles, 10 c.c. normal acid added, the bottles were then stoppered with rubber stoppers firmly tied, and placed in a salt-bath and boiled respectively for three, four, and six hours. The contents of the bottles were then neutralized, diluted, and starch calculated from the amount of grape sugar present. The solution boiled six hours had 0.02 per cent. more starch than that boiled four hours. Three hours' boiling did not convert all of the starch into grape sugar. The residue from which the starch was taken was

boiled with sodium hydroxide, thrown upon a weighed filter, and repeatedly washed with the same solution, then washed with hot water, and finally with alcohol and then with ether. The washed residue was dried at 110° C., and weighed, then incinerated, the weight of ash subtracted from the former weight, and the difference estimated as fiber, The gram reserved for the albuminoids was ignited with soda-lime, and albuminoids determined as usual.

The oil was extracted by ether from five grams of the dried cane.

The total water was estimated by adding the per cent. of loss of the air-dried cane and the hygroscopic water.

RESULTS.

Composition of stalks of Orange cane in one hundred parts.

Water	76.58
Grape sugar	3.00
Cane sugar	9.77
Starch	4.12
Fiber	4.54
Oil	0.07
Gums and vegetable acids	0.24
Soluble albuminoids	0.23
Insoluble	0.16
Soluble ash	0.68
Insoluble ash	0.06
	99.45

ASH

The ash from the remaining dried cane was analyzed by the following method: The cane was incinerated at a low heat, pulverized, dried and put in a stoppered bottle.

Chlorine.—Two grams of the ash were exhausted with water, silver-nitrate added to the extract and the whole acidified with nitric acid. The precipitate of the chloride of silver was collected upon a filter, dried, ignited, weighed, and the chlorine collected in the usual manner. The filtrate was treated with excess of hydrochloric acid, silver chloride removed and the solution preserved.

Silica.—The ash insoluble in water was treated with hydrochloric acid, brought to dryness, moistened with hydrochloric acid, water added, and the residue thrown on a weighed filter. The filter and its contents were heated at 160° C. until of constant weight, then ignited, and the silica weighed. The loss found between the two weights was called charcoal.

The solution from which the chlorine had been precipitated and the filtrate from the silica were mixed, and the whole diluted to 200 c.c., and well shaken. 50 c.c. of this solution were reserved for the estimation of sulphuric acid and alkalies, 50 c.c. for phosphoric acid, manganese, lime, and magnesia.

Iron.—The remaining 100 c.c. were treated with sulphuric acid, and heated upon a water-bath until the chlorine was expelled; then transferred to a flask, water and sulphuric acid added, and the iron

reduced with hydrogen, generated by zinc suspended in the liquid, by means of a platinum wire. To facilitate the operation, a strip of platinum was introduced into the flask and allowed to come in contact with the zinc. After the reduction, the iron was estimated by a standard solution of potassium permanganate.

Phosphoric Acid.—A solution of ferric chloride was added to the portion reserved for phosphoric acid, etc., in sufficient quantity for the iron to combine with all the phosphoric acid present. Sodium carbonate was added until the last drop caused a precipitate, which did not re-dissolve upon agitation. The mixture was then heated, a hot solution of sodium acetate added, and the whole brought to the boiling temperature, filtered and washed with hot water.

The residue was dissolved in nitric acid and concentrated to about 10 c.c.; a nitric acid solution of molybdate of ammonia was added in excess, and the mixture allowed to stand in a warm place for 24 hours. The precipitate was collected on a filter, the beaker rinsed, and the contents of the filter washed with a mixture of the molybdate solution and water. The precipitate was dissolved in the smallest quantity of ammonia. Any of the phospho-molybdate precipitate remaining in the beaker was dissolved in a mixture containing 3 parts of water and 1 of ammonia and thrown upon the filter; finally, the filter was washed with the ammoniacal water. The filtrate was boiled, and the phosphoric acid precipitated with a mixture of ammonium-chloride, magnesium sulphate and ammonia, made according to Fresenius' formula. After allowing the mixture to stand 12 hours, the precipitate was collected on a filter, washed with ammonia water, and the volume of the filtrate and washings noted.

The precipitate was ignited in a platinum crucible, a little nitric acid added, and again ignited to oxidize the charred matter present, cooled, and weighed. As ammonia-magnesia-phosphate is soluble in about 54,000 parts of ammoniacal water, .003 of a grain was added to this weight, as the filtrate measured a little over 150 c.c. The phosphoric acid was then calculated from this weight of pyrophosphate of magnesium.

Manganese.—The solution from which the iron and phosphoric were precipitated was treated with a few drops of bromine, and boiled to precipitate the manganese. The precipitate was collected upon a filter and thoroughly washed, then strongly ignited, and weighed.

Lime.—The above filtrate was concentrated, and while hot a little ammonia added, and then an excess of ammonium oxalate, to precipitate the lime. The mixture was allowed to stand 12 hours. The precipitate was then collected upon a filter, dried, and ignited in a platinum crucible. After the filter was reduced to ash, carbonic acid was passed over the ignited lime, to reconvert any oxide formed into carbonate. From the weight of calcium-carbonate thus obtained the per cent. of lime was calculated.

Magnesia.—The filtrate from the lime was concentrated, ammonia added in excess, and then a solution of phosphate of soda to precipitate the magnesia present. This precipitate and its filtrate were treated the same as the corresponding one, the estimation of phos-

phoric acid. The magnesia was calculated from the amount of pyrophosphate of magnesia found.

Sulphuric Acid.—The 50 c.c. of the solution reserved for this purpose were boiled, and the sulphuric acid precipitated, with a slight excess of barium-chloride. The precipitate was collected upon a filter, washed, ignited, and weighed.

Potassa.—The above solution was treated, after concentration on a water-bath, with ammonia and ammonium-carbonate as long as any precipitate was formed, digested on a water-bath, filtered, and the contents of the filter carefully washed. The filtrate and washings were evaporated to dryness on a water-bath, and the residue ignited to expel ammoniacal salts. This residue was then treated with five and one-half times its weight of pure oxalic acid in the form of a concentrated solution, then evaporated to dryness, and again ignited to dull redness. The ignited residue was treated with a small quantity of boiling water, thrown upon a filter, washed with hot water, hydrochloric acid added to the filtrate, the mixture evaporated to dryness, and gently ignited, and the weight of the alkaline chlorides ascertained.

The separation of the alkalies was effected with platinic chloride, as follows:

The residue of alkalies was dissolved in a little water, and enough platinic chloride added to combine with the alkalies estimated as potassium salt. This mixture was evaporated nearly to dryness over a water bath, care being taken not to boil the water. A mixture of six volumes of alcohol and one of ether was poured over the residue, and the whole allowed to stand sevcral hours in a covered vessel, with occasional stirring. The insoluble potassio-platinic chloride was transferred to an equipoised filter, washed with alcohol and ether mixed, and finally dried at 100° C., and weighed.

Soda.—From the weight of the double potassium chloride, the amount of the potassium chloride was ascertained. The weight was subtracted from the weight of the combined alkali chlorides, and the remainder called sodium chloride, and calculated as soda.

Carbonic Acid.—One gram of the ash was transferred to a Rose carbonic acid apparatus, and the carbonic acid estimated by loss. The following were the results obtained:

Composition of ash.—

Silica	27.91
Iron oxide	0.14
Phosphoric acid	5.37
Manganese oxide	0.89
Lime	6.82
Magnesia	4.64
Sulphuric acid	6.23
Potassa	46.48
Soda	0.98
Sodium chloride	0.42
	99.88

ANALYSIS OF SORGHUM SEED.

A sufficient quantity of the seed was ground as fine as possible in an iron mortar, and was preserved in a glass-stoppered bottle.

The following portions of the ground seed were taken:

10 grams, for the estimation of sugar, dextrine, starch and fiber.
1 gram, " " water and ash.
1 " " " albuminoids.
1 " " " oil.
1 " " " tannin.

Sugar, etc.—The ten grams reserved for sugar, etc., were rubbed up thoroughly with water in a mortar, then transferred to a filter and washed well with water.

Solution=A.
Residue=B.

The solution, A, was concentrated to about 10 c.c. in a porcelain dish on a water bath, then transferred into a strong prescription bottle and washed with about 10 c.c. of water, and the washings added. 5 c.c. of normal sulphuric acid were added, the bottle closed with a rubber stopper securely tied. The bottle and its contents were then transferred to a salt bath and boiled for six hours. After cooling, the contents of the bottle were transferred to a graduated cylinder, neutralized and diluted to 100 c.c., the coloring matter precipitated with acetate of lead, and, after thoroughly mixing, the whole was allowed to stand until the precipitate had settled to the bottom. A portion of the clear liquid was then transferred to a burette and dropped into 10 c.c. of Fehling's solution, diluted four times, and at the boiling temperature, until the whole of the copper had been precipitated as cuprous oxide. This point was determined by filtering a small quantity from time to time, acidifying the filtrate with acetic acid, and testing for copper with ferro-cyanide of potassium. The number of c.c of the sugar solution it took was noted, and the sugar and dextrine determined by the following proportion:

1. The number of c.c. it took to precipitate copper solution: total number of c.c. : : .05 (grams of grape sugar required to precipitate 10 c.c. of Fehling's solution) : x.

X multiplied by 0.95 will give the grams of sugar in 10 grams of seed.

The residue, B, was washed on the filter with alcohol acidulated with sulphuric acid and finally with water, to dissolve the gluten. Then the residue was washed off the filter into a beaker diluted to about 400 c.c., 5 c.c. of sulphuric acid added, and the whole boiled on a water bath until the liquid had no milky appearance. It was then filtered through an equipoised filter and washed.

Solution=C.
Residue=D.

Solution C was diluted to 500 c.c. 50 c.c. of this solution were transferred to a prescription bottle and then treated as above for sugar and dextrine. From the grape sugar obtained, the amount of starch was calculated.

Residue D was boiled with hot sodium hydroxide, again thrown upon the filter and washed with the same solvent; afterwards, with

hot water, then with alcohol, and finally with ether. The washed residue was dried at 119° C., weighed, ignited, and the amount of ash deducted. The remainder was estimated as fiber.

Water.—For the estimation of water, the ground seed was weighed in a glass-stoppered test tube. After weighing, the glass stopper was replaced by a rubber one, through which passed two glass tubes, bent at right angles. One of these tubes was connected with an aspirator; the other, with a calcium chloride tube and a sulphuric acid drying bottle. The test tube and its contents were then placed in an opening of a drying oven, whose temperature was between 100 and 110°C. During the operation, a current of air, passing through the sulphuric acid and calcium chloride tube, thus drying it, was drawn into the tube and the moisture sucked out by means of the aspirator. When the weight became constant, the loss was estimated as water.

Ash.—The contents of the tube were transferred to a platinum crucible, incinerated, and ash weighed.

Albuminoids.—One gram of the ground seed was ignited with soda lime. the substance was intimately mixed with a portion of soda lime sufficient to fill a 14-inch combustion tube two-thirds full. About two inches of the tube were filled with soda lime, then the mixture of soda-lime and substance added, the mortar rinsed with soda-lime, and finally the rinsings and enough soda-lime added to nearly fill the tube. A plug of asbestos was put in, and the tube gently tapped to insure an air passage throughout its length.

Will's bulbs were charged with a deci-normal solution of oxalic acid. The tube being placed in the combustion furnace, was connected with the bulbs. The fore part of the tube, containing the soda-lime only, was heated to redness, then heat applied, one jet at a time, along the entire length of the tube, care being taken that the combustion was completed in that portion of the tube where heat was applied before other jets were turned on, and also that the combustion was not too rapid. After the combustion was ended, the contents of the bulbs were transferred to a beaker, tincture of litmus added, and the excess of acid titrated with a deci-normal solution of potassa. The amount of ammonia found to be present was calculated as nitrogen. The nitrogen was multiplied by 6.25, and the result called albuminoids.

Oil.—The one gram of ground seed reserved for the estimation of oil was placed in a short test-tube, the bottom of which was drawn out in the shape of a cone, with a small opening at the apex. A small filter placed in the cone kept any of the substance from passing through the opening. The tube was suspended in a small flask, and this stoppered with a cork through which a long glass tube passed. The whole was placed in a water bath, ether ($\frac{1}{2}$ oz.) put in the outer tube, and heat applied to the water bath until the temperature of the water boiled the ether. This operation was continued for half an hour, the percolate transferred to a small weighed beaker, ether evaporated, and the beaker and its contents dried at 100° C., and then weighed.

Tannin.—One gram of the pulverized seed was digested with hot water for several hours, and the tannin estimated by a standard solution of gelatine.

Composition of Sorghum Seed—Orange.—

Sugar	0.56
Starch	63.09
Fiber	6.35
Water	12.51
Ash	0.64
Albuminoids	7.35
Oil	3.08
Tannin	5.42
Total	99.00

EXPERIMENTS IN SUGAR MAKING—1880.

The grinding of cane and the evaporation of the juice began on the 18th of September. It was the intention to begin working up the Early Amber as soon as possible after it had reached its maximum per cent. of cane sugar, and thus have it finished by the time the Orange was ready to harvest, leaving a small portion for subsequent experiments. Owing to the delay in the arrival of machinery, the work was not begun until the above date.

The Early Amber had been ripe for over two weeks, and was lying prostrate from the effects of a storm. The Orange was ripe. The object of these investigations was to see whether any method of manufacture of the juice into syrup could be depended upon to insure the subsequent crystallization of the sugar.

These investigations were undertaken with a view to the simplicity of machinery used and to the economical manufacturer of the syrup, so that they could be of practical use to the farmer, should any of the experiments prove successful.

The apparatus used for crushing and pressing the cane was a two-horse Victor mill, with three upright rollers. The juice was evaporated in Cook's evaporator, with furnace attached, and of the size recommended for use with a two-horse crusher.

The remaining apparatus consisted of barrels, tubs, pails, etc.

An attempt was made to heat the juice for skimming and clarification after it had been treated by chemicals, in the pan of a steam boiler of the form used by farmers to cook food for cattle. This boiler was found unfit for the purpose, as the temperature of the juice could not be raised in it above 108° C. A small pan was made, similar in construction to a Cook's evaporator, but furnished with a double bottom. The steam space in the bottom was about two inches high, and was connected with one of the boilers in the Chemical Laboratory. The object was to test the feasibility of evaporating the juice by steam under pressure with shallow pans.

In the experiments which follow, the juice was either evaporated directly after it came from the mill, *i. e.*, without the use of reagents, or after it had been submitted to clarifying processes. In the first, the juice is designated in the experiment as *not clarified*, in the second, as clarified, defecated, or *neutralized*.

THE EXPERIMENTS.

1. *Early Amber.*—September 18. Cane, very ripe and down; juice, *not clarified,*—evaporated to a syrup which upon cooling weighed 11 lbs. to the gallon. It was of a light color and had a distinct sorghum taste. Stalks, stripped and topped, yielded 48 per cent. of juice, having a specific gravity of 1.066. The sugar, not crystallized.

2. *Early Amber.*—September 20. *Juice defecated.* As the juice was brought from the mill, milk of lime was added, little at a time, until a piece of red litmus paper would change to purple when dipped into the juice. Then a solution of tannic acid and finally gelatine was added. The juice was then boiled and well skimmed, and concentrated to syrup. The syrup was scorched and had a taste of extract of licorice. A small portion of the syrup evaporated to almost candy, was readily crystallized.

3. *Early Amber.*—September 21. Juice not clarified. The evaporation was continued until the syrup upon cooling weighed 11 lbs. The sugar did not crystallize.

4. *Early Amber.* September 22. Juice made alkaline with lime, and then neutralized with sulphate of alumina. Concentrated to a syrup that weighed when cooled between 11 and 11½ lbs.; sugar crystallized.

Before expressing the juice for this experiment the rollers were moved closer together and the cane crushed so much that the bagasse as it came out fell in pieces. 51 per cent. of juice was obtained with a specific gravity of 1.068. One row of cane (0.037 acres) was taken for this experiment, producing 23 gallons juice from which was made 3.17 gallons syrup, weighing 11¾ lbs. per gallon. Calculating from this data, an acre of the Early Amber would yield 624.2 gallons of juice, or 86.1 gallons of syrup.

5. *Orange.*—September 13. Juice neutralized with milk of lime; afterwards tannin and gelatine added; evaporated to a syrup of 12 lbs. to the gallon; syrup dark. The sugar commenced crystallizing in a few days. Three weeks afterwards the sugar was separated from the syrup by a centrifugal separator. Sugar, brown.

In this experiment, 360 lbs. of topped and stripped stalks were used; producing 155 lbs. of juice (43 per cent.); 28 lbs. syrup (7.78 per cent. of the stalks and 18.04 per cent. of the juice); 13½ lbs. sugar (3.8 per cent. of stalks, 8.87 per cent. of juice, 49.1 per cent. syrup.)

One row, .0398 acres, yielded 30 lbs. juice. Calculating the yield of an acre from these data, we have 754 gallons juice, 120.6 gallons, or 1,447.2 lbs. syrup, and 710.67 lbs. sugar.

6. *Orange.*—September 24. Juice neutralized with lime, and a few drops of tannin added to every 10 gallons juice; then ⅛ oz. gelatine, and afterwards a little sulphate of alumina. Juice evaporated to a syrup of 11 lbs. to the gallon; color, very light. Sugar began crystallizing after standing two days.

7. *Orange.*—September 27. Juice neutralized with lime, and concentrated to a syrup of 11 to 12 lbs. per gallon. Sugar readily crystallized.

8. *Orange.*—September 27. Juice neutralized with milk of lime; *sulphurous* acid was added to combine with any lime remaining uncombined in the juice. The sugar began crystallizing as the syrup was cold.

9. *Orange.*—October 1. Juice defecated with lime and sulphate of alumina. Sugar began crystallizing after three days. In this experiment stripped and topped stalks were used; yielding 54.2 per cent. of juice; specific gravity, 1.076.

10. *Orange*—Oct. 1. Juice evaporated without defecation. The syrup, after standing about five weeks, had but few crystals of sugar. In a subsequent analysis of this syrup (see analysis of syrup, No. 4), there was found to be 38.9 per cent. of cane sugar, and 26.91 per cent. of grape sugar.

11. *Orange.*—Juice not defecated; evaporated to a syrup of 12 pounds to the gallon. The sugar has not crystallized.

12. *Amber.*—Juice defecated with lime and sulphate of alumina. The juice was quite acid as it came from the mill. Syrup black. Sugar crystallized.

Finding that some of the syrup whose juice had not been defecated did not crystallize, it was thought that perhaps a farther concentration would cause the sugar to crystallize. For this purpose the syrup produced in experiment No. 3 was selected. In the early part of November it was further concentrated in the steam evaporator, but this had no effect upon the crystallization of the sugar.

Finding that the concentration of the syrup did not cause the sugar to crystallize, an analysis of several of the syrups was undertaken, in order to investigate this subject more thoroughly. The following syrups were selected to be analyzed:

No. 1. *Early Amber.*—Syrup taken from that made in experiment No. 3.

No. 2. Syrup of No. 1 subjected to further concentration.

No. 3. *Orange.*—Syrup of experiment No. 9, with the crystallized sugar taken out by the centrifugal separator.

No. 4. *Orange—Obtained from the syrup of experiment No.* 10.—The following were the results obtained:

COMPOSITION OF SORGHUM SYRUPS.

Number.	Cane Sugar.	Grape Sugar	Gum.	Water.	Ash.	Total.
No. 1.....	47.22	14.70	6.80	29.4	1.97	100.1
No. 2.....	45.62	20.00	10.51	20.39	3.78	100.3
No. 3.....	35.63	26.82	6.75	28.67	1.40	99.27
No. 4.....	38.9	26.91	7.80	24 04	1.75	96.40

The cause of the large per cent. of ash shown by No. 2 was undoubtedly the lime added to neutralize the syrup before the second concentration.

From the proximate analysis of the cane, it appears that one acre of sorghum produces 2,559 pounds of cane sugar. Of this amount we obtained 710 pounds in the form of good brown sugar,

and 265 pounds were left in the 737 pounds of molasses drained from the sugar. Hence, sixty-two per cent. of the total amount of sugar was lost or changed during the process of manufacture. This shows that the method of manufacture in general use is very imperfect.

EXPERIMENTS IN SUGAR MAKING, 1881.

Last year a large number of experiments were made in order to determine the means by which the cane sugar could be made to crystallize. This object was much more readily attained than we at first expected, and consequently we selected from those experiments the one which was most simple and most likely to be practicable when operating on a large scale. In perfecting this our attention was given to the production of sugar and syrup which should be free from the objectionable sorghum taste and odor. In this we succeeded perfectly. Sorghum juice in its normal condition is acid. The conversion of cane sugar into grape sugar by boiling a solution of the same with a strong acid, as sulphuric or hydrochloric, has long been known to chemists. All other acids, even the weak organic acids contained in sorghum juice, act in a similiar manner. Hence it will readily appear why, in the ordinary manner of making sorghum syrup, so little of the cane sugar originally contained in the juice can be made to crystallize. A great deal of the cane sugar is converted into grape sugar during the process of defecation and evaporation, and what remains unchanged is prevented from granulation by the undue proportion of grape sugar produced. To avoid this loss of cane sugar we neutralize the juice when cold with calcium carbonate or milk of lime or both. This part of the process requires skill and care, as the subsequent defecation of the juice depends upon it. After thus neutralizing the juice it is heated to boiling and thoroughly defecated. It is then passed through bone-back filters and finally evaporated to crystallization. The sugar and molasses obtained by this process are unobjectionable in regard to color and taste.

Exp. 1.—August 22 1881. The cane selected for this experiment was grown on land which had previously been used as a barn-yard, the same as in analyses Nos. 8 and 14. The seed was very ripe and the cane very thrifty.

Wt. of cane crushed	1.560 lbs.
Wt. of juice obtained	687.50 lbs.
Per cent. of juice	43.40

The juice was carefully neutralized with milk of lime, and brought to the boiling point in the defecating pan. A very heavy green scum rose, and this being removed the juice was seen to be full of a green light flocculent precipitate which did not subsequently rise to the top, in any considerable quantity. The juice was now drawn off into tubs, where it was allowed to repose twelve hours. At the end of this time only about one-half of the juice could be drawn off clear, the precipitate being still suspended in the remainder. It was found impossible to filter this portion and it was therefore thrown away. The clear juice after being passed through bone-brake was evaporated in a copper finishing pan to the crys-

tallizing point. The melada had a very unpleasant saltish taste owing to the presence of salts of ammonia. The sugar crystallized very readily, and although it looked well it still retained somewhat of this saltish taste after being separated from the molasses. Unquestionably this excessive amount of albuminoids—the green scum and suspended precipitate—was taken up by the plant from the nitrogenous elements of the manure, and the saltish taste was due to ammonium salts which came from the same source.

Manure therefore not only has a deleterious effect upon the development of sugar in cane, but it also prevents the thorough defecation of the juice which is necessary to the manufacture of sugar.

Experiment 2—Aug. 25. Cane same as that of which analyses Nos. 15 and 16 were made. Size of field 3-16 of an acre.

CALCULATIONS FOR ONE ACRE.

	Pounds.
Stripped cane with tops	18,535.3
Stripped cane without tops	15,765.9
Weight of juice obtained	6.545.6
Per cent. of juice of stripped and topped cane	41.52
Weight of melada from juice	1,298.7
" " " bagasse	253.9
Total weight of melada	1,552.6
Weight of sugar from juice	504.6
" " " bagasse	104.0
Total weight of sugar	608.7
Weight of molasses from juice	794.7
" " " bagasse	149.2
Total weight of molasses	943.9

Calculations for one ton of topped and stripped cane:

Weight of juice	830.4
" sugar	77.2
" molasses	119.7

To obtain the sugar from the bagasse it was packed in large barrels as it left the mill and was exhausted with water. The percolate thus obtained was treated like juice.

Experiment No. 3—Sept. 17. Early Amber. Obtained from the University farm. Volunteer growth among the corn. Seed ripe. Cane mostly blown down:

	Pounds.
Weight of stripped and topped cane	1,440
Weight of juice	637
Per cent. of juice	44.2
Weight of melada obtained	145.8

Experiment No. 4. Early Amber, grown upon University farm:

	Pounds.
Weight of stripped and topped cane	1,661.0
" juice obtained	603.5
Per cent. of juice	36.33

Weight of melada from juice	95.5
" " " bagasse	13.5
Sugar from juice	41.5
" " bagasse	6.0
Molasses from juice	54.0
" " bagasse	7.5

In the last two experiments the cane was poorly developed, and full of suckers, and consequently poorly adapted for the production of sugar.

GLUCOSE FROM SORGHUM SEED.

Our experiments have shown that as good glucose can be made from the seed of sorghum as from any other starchy substance. The yield of glucose or grape sugar is three-fourths or more of the weight of seed employed. The tannin does not interfere, as it is converted into glucose by the same means which are used to convert the starch, namely, boiling with dilute acids.

RECEIPTS AND EXPENSES OF ONE ACRE OF SORGHUM.

On the basis of the results actually obtained as described in the foregoing pages, we have calculated the receipts, and from the best data at hand the expenses for one acre of sorghum.

BALANCE SHEET.

RECEIPTS FROM SUGAR AND MOLASSES.			
600 pounds sugar at 7 cents	$42 00		
85 gallons molasses	34 00		
		$76 00	
EXPENSES.			
Cultivating one acre	$10 00		
Stripping and cutting	2 50		
Hauling	6 00		
Four days' labor	6 00		
Fuel	1 00		
Barrels	4 00		
Freight and drayage	8 00		
		37 50	
Net profit on sugar and molasses		$38 50	$38 50
RECEIPTS FROM GLUCOSE.			
1,250 pounds glucose at 2 cents		$25 00	
EXPENSES.			
Gathering seed	$2 00		
Fuel	1 50		
Labor	2 00		
Barrels	4 00		
		9 50	
Net profit on glucose		$15 50	15 50
Total net profit on one acre of sorghum			$54 00

GENERAL CONCLUSIONS.

1. Seed should be planted as early as possible.
2. The proper time to begin cutting the cane for making sugar is when the seed is in the hardening dough.
3. The cane should be worked up as soon as possible after cutting. Cane which is cut in the afternoon or evening may safely be worked up the following morning.
4. The manufacture of sugar can be conducted properly only with improved apparatus and on a scale which would justify the erection of steam sugar works, with vacuum pans, steam defecators and evaporators, and the employment of a competent chemist to superintend the business. The same is true for the manufacture of glucose from the seed. Our experiments were made with the ordinary apparatus used in manufacturing sorghum syrup, and any person, who desired to work on a small scale, could use the methods with good results, provided he had acquired the necessary skill in neutralizing and defecating the juice and in the treatment of bone-black filters. The manufacture of glucose on a small scale is entirely out of the question. Five hundred to a thousand acres of sorghum would be sufficient to justify the erection of steam sugar works, and this amount could easily be raised in almost any community within a radius of one or two miles from the works.

THE BACTERIA:

AN ACCOUNT OF THEIR NATURE AND EFFECTS, TOGETHER WITH A SYSTEMATIC DESCRIPTION OF THE SPECIES.

By T. J. Burrill, Ph. D., *Professor of Botany and Horticulture.*

CONTENTS.

INTRODUCTION.

Biology—the science of life—has no more interesting and important problems than those concerning the smallest and simplest of animate objects, the *Bacteria*. These exceedingly common living things, visible to us only by the aid of powerful magnifiers, have latterly received much attention on account of the endeavor to find out by scientific research, the orgin of life on our globe; but more for the undreamed of power and influence which they have been found to possess and exercise in the operations of the organic world. Since the discovery of their existence and modes of action, many questions previously unanswerable have become easy, and the knowledge obtained has passed into science to serve, not only as an intellectual stimulus to man, but as sure standing-ground from which he may reach other heights and gain at last his rightful dominion over the forces and objects of earth.

It is not too much to say that mankind could not continue to exist, could never have existed, on the earth as at present constituted, but for these minute though effective agents; the truth of this does not depend on any mere figure of speech, or even on any delicate adjustment of nature, but on the actual and essential work accomplished. Without them, and with other things as they are, there could have been no fertile soil, no luxuriant pastures, no bountiful harvests, no possibility for man. On the other hand we should not suffer many of the ills that flesh is heir to, if we could escape their restless activities in certain forms and ways.

It is the object of this paper to present, in language freed as far as possible from technical terms, the principle and most interesting facts now known about these silent-working denizens of the earth, the air, and the water. Should any one wish to inquire further, he may soon find an abundant literature on the subject; but the whole matter is still so new that a great proportion of it is only to be found in the scientific periodicals of the last two decades, and unfortunately for many, mostly in foreign tongues. The best general work of American publication is *The Bacteria*, a translation from the French of Dr. Magnin, by Dr. G. M. Sternberg: Little, Brown & Co., Boston, Mass. There are several excellent general articles in numbers of the Popular Science Monthly, and very instructive reports by Drs. Detmers, Law and Salmon, on infectious diseases of animals, in the annual reports of the United States Commissioner of Agriculture, for 1878, 1879, and 1880. For "blight" in pear trees, etc., see report for 1880, of the Illinois Industrial University.

Charles S. Dolley, of Rochester, N. Y., has issued in pamphlet form a translation from the German of an interesting general article by Ferdinand Cohn.

For the practical study of these minute organisms, a good compound microscope is required and the ability to use it; but any one possessing ordinary capacity for scientific study, with plenty of patience, may gain a large amount of information by the aid of an instrument costing not more than fifty to one hundred dollars.

The organisms may be readily obtained by putting a few bits of flesh or of any soft animal or vegetable matter in water kept at the ordinary temperature of a comfortable living-room and allowed to stand one to several days. Characteristic species often occur in given infusions. Others may be sought for in decaying fruits and vegetables, on the surfaces of cooked articles of food, as of boiled potatoes, rice, beans, &c., while some are commonly present in the mouth, especially in the collections on the teeth and the fur of the tongue. The pus from external wounds, and very often the discharges from pimples, boils, ulcers, etc., contain myriads of the organisms.

Bacteria may be mounted for preservation on the usual thin cover glasses used by microscopists, and the covers inverted and fastened to the ordinary microscopical slides. First smear the cover glass with the material containing the *bacteria*, and after drying a few minutes immerse in strong alcohol to fix the specimens by coagulation of the imbedding substance. Then stain by immersing in common violet ink (aniline) at least five minutes, wash in water and mount in a weak, aqueous solution of carbolic acid. There are many other processes and materials used to advantage in certain cases, but this is the simplest and most generally successful of any now known.

I have not considered it wise to encumber these pages with references, yet make no claims to anything original except as indicated in the proper places. I have, however, verified by experimental studies much of the information presented, gained in the first place from others.

PART I. NATURE AND ORGANIZATION.

1. EXISTENCE AND HABITAT.

The minute organisms, to which the term *Bacteria* is now commonly applied, cannot be individually recognized without a magnifying glass of high power; so, to those not accustomed to work with the compound microscope, the existence of the little creatures as common objects may not be suspected, or at least rationally realized. To be sure much is said of the life of a drop of water or other fluid; but a large amount of this sort of retailed information is purely imaginary, having nothing or little of truth about it. The fact is, pure water, such as is taken from a good well or spring, has absolutely no life in itself, nor are there in it any living things whatever, no matter what magnifying power one examines it with. On the other hand, there are no other living things in nature, from the highest to the lowest, so widely distributed in the earth, the air and the water, throughout the world, so commonly and multi-

tudinously present, near us, and on us and in us, as the various kinds of the microscopic organisms of which we now write. If pure well water does not contain these or any other living things, all foul waters do. *Bacteria* or their allies exist in countless myriads in all filth, in all decomposing vegetable or animal matter, whether ill-scented or not, in all organic substances undergoing apparently spontaneous change, as heating in the mass, becoming sour, rancid, or putrid, and, generally, those changes known as fermentation or decay.

The water from ill-scented cisterns, and indeed from many in which odor is imperceptible, contains varying numbers of these minute living creatures. The water of foul ditches, stagnant ponds, marshes and sloughs teems with them, in numbers surpassing those of the leaves of the forests; a drop under the microscope often presents a maze of living forms, more wonderful than imagination ever pictured, or of which fiction ever dreamed. The waters of running streams are more or less inhabited by them, and the ocean itself is the special home of peculiar kinds.

The air may, like water, be absolutely pure or clouded by innumerable numbers of the almost imponderable, but living, multiplying things. Wherever there is floating dust of organic origin, they may be said to be certainly present. The stifled atmosphere of close apartments, and of thickly built streets, especially over decomposing filth, is laden with various forms of *Bacteria* and allied organisms; and these are unavoidably inhaled by ourselves with every breath inspired. But in the dry, open country, few of them can be found in the pure, fresh, invigorating air, and over wide desert regions and the tops of high mountains none whatever exist. With us the air in winter, especially when the earth is long covered with snow, becomes almost free, while in midsummer and autumn, especially after damp and close weather, their myriad numbers are wafted to and fro by every movement of the freighted atmosphere.

The shine on vessels of standing water, on the surface of vegetable or animal substances, like cold articles of food set away for some time, *eg.* boiled potatoes, cooked meats, etc., is composed of these organisms and their products. Brewers' yeast, used in bread making, is not a *Bacterium*, but it is a related growth, and the so-called salt-rising, not unfrequently used in making bread, owes its energy to living *Bacteria*. Sour milk always contains swarms of the microscopic, moving things, and during the formation vinegar from the juice of fruits, from solutions of whisky and sugar, etc., they may always be found in similar numbers.

They are invariably present in pus from open, suppurating wounds, in the discharge from boils and tumors on and in our own bodies, and in the ill-scented accumulations of the bodily excretions, as from the arm-pits and unwashed feet. If they have any connection with bad odor, no one will wonder why the breath sometimes smells bad if the material collecting on the teeth or the fur on the tongue can be seen under a good microscope. The cleanest human mouth can hardly be said to be ever perfectly free from these active organisms; while, those to which the tooth brush or its equivalent is a stranger, are veritable culture boxes, or hot houses, richly supplied with rapidly growing and prodigiously multiplying forms and

kinds. We swallow them with our food, and at least some kinds sometimes retain their activity in the stomach and intestinal tube. It now seems certain that the latter is always inhabited by special kinds which have to do with the activities there in operation. In health the blood is usually quite free from them, but in certain diseases this too, as it rapidly courses through the arteries and veins, sweeps along in the current myriads of the minute but living and developing, ever active things, inappropriately called "germs." We may well say in such cases that "the blood is out of order."

What perhaps more than all else gives vivid interest to our microscopical studies of this sort, is the fact that special kinds of these tiny living beings are found uniformly in connection with the severest diseases known to man, either of himself or of the plants and animals about him. We may name as examples "blight" in pear, apple and many plants, hog and chicken cholera, pleuropneumonia and splenic fever in cattle; malaria, typhoid fever, diphtheria, small-pox in man. What the connection is between organisms and the diseases, we leave for another part of this paper. Very recently it has been fully demonstrated that consumption, the most terrible scourge of the human race, invariably has its accompanying specific form in the diseased tissues and the exudations from them.

It will thus be seen that these microscopic organisms are by no means unusually or uncommonly present about, upon and within us. Taken as a classified group they are more widely dispersed and dwell more numerously everywhere, in everything, than all other living things put together. For the truth of this statement I need only to appeal to the observation of any one who, having a good compound microscope, will take the trouble to state the facts as seen. Still it would be unfair to leave the impression that any one specific kind is thus invariably near us, or that the most common, taken as a simple species, is as widely and thoroughly disseminated as might be inferred from the foregoing. The statements made have reference to the numerous species comprised in the entire group, not to certain ones. It is one thing to say that birds are very widely dispersed over the earth; it is quite another thing to state the facts as they are concerning the common domestic fowl or the snowy owl.

2. Color, Shape, Size.

As a rule *Bacteria* are white, so that when numerous in water the fluid is opalescent or milky. They very frequently settle down, when the proper food supply is exhausted, to the bottom of the containing vessel, and in this case form a white shiny or flocculent mass. But of numerous species each has its peculiar color, as red, blue, yellow or green. On the moist surfaces of prepared articles of food, as of cooked potatoes, bread, cheese, rice, etc., spots of a red color much resembling drops or splashes of blood are not uncommon. Formerly these reputed blood-stains were regarded with superstitious wonder, and have been held to indicate guilt, and the anger of God. These, as well as other colored spots and pigments, are now traced to their true cause, and are found due to the dis-

tinct color of the organisms themselves or to the chemical combination which they produce.

The different kinds of *Bacteria* vary in shape from spherical to oval, cylindrical and thread-like; and the latter are straight, or crooked, or spiral, flexible or rigid. The spherical ones are often connected in two's or more, and sometimes form bead-like strings or chains. The main classifications in use are based on the form and size of the organisms.

It was impossible to know anything about *Bacteria* until after the invention of the microscope, because none of them can be individually seen with the unaided eye. In transverse diameter, one twenty-five thousandth of an inch is a very common measurement, while some, including spherical ones, are even less than half this size. Now, a dot one two-hundredth of an inch across is barely visible to the eye of most persons, hence a magnifying power of more than one hundred times across (ten thousand in area) is required to barely see a common sized *Bacterium*. To make out its real shape and any details of structure, ten times the enlargement mentioned is necessary, and not unfrequently as much more as can be secured by the highest possible powers of the microscope. Increase the heighth of an ordinary man one thousand times and his head would be over a mile above the earth, yet under the same magnification one of these organisms would have plenty of room to swim freely, to stand on end and dance up and down, in the film of water included between two pieces of flat glass pressed so close together as to strongly adhere by capillary attraction. From one hundred to two hundred and fifty of them placed side by side would be required to stretch across the ordinary thickness of book paper. They are the smallest living organisms known to man, yet, as we shall see, by no means the least important in the economy of nature.

3. Movements.

Bacteria have sometimes been divided into groups upon their apparent ability to move or not; but further study has demonstrated that many, if not most, species have states in which they remain at rest, and others in which they are freely motile. These states depend partially on their stage of development, partly on the surrounding conditions. For the latter the degree of moisture and temperature, and the food supply, are especially effective.

Some species at most only oscillate and quiver in the fluid medium in which they grow, never making progress in any given direction; others slowly and smoothly glide along in a straight but more often undulating path, while still others whirl and dance and roll, turning over and on end, now spinning round and round, now swaying gently back and forth, now darting like a flash across the microscopic field. Sometimes they move as though perfectly free and had abundant muscular force, at other times they appear to be struggling to overcome obstructions, or to free themselves from some impediment. Not unfrequently they may be seen to carry along little adhering extraneous particles, well showing their vital power, or two, in some way attached, pull in opposite directions with varying advantage for the one or the other.

No one, having once seen these motions, can doubt the inherent power the little things possess, or can question their right to be classed as living objects; whether as animals or plants will depend on his previous information and experience, as well as upon what he sees. How they move, that is by what sort of organs or mechanism, is not easy to make out; but they have this power only when immersed in a fluid medium. When dry they are motionless except as carried by external agents, as air currents.

It is now well known that different species have different methods and facilities for dissemination. Many kinds are externally viscid, or, are always when moist imbedded in a mucilaginous exudation, and hence in either case adhere to any solid substance they may touch. These therefore are rarely found floating in the air. So long as the material containing them does not become dry and then pulverized, such species are not distributed by the currents of the atmosphere. It is quite possible that a foul drain or a filth-filled cesspool may contain myriads of disease-producing *Bacteria* which are only taken into the human body by swallowing them in contaminated water, the vitiated air though laden with fetid gases being harmless, yet this can by no means be said of all species known to be injurious to man. Their great numbers, their exceedingly minute size and their powdery character in mass, together in many cases with their long contained vitality, pre-eminently fit them for aerial distribution. The dust made evident by a sunbeam is often in considerable portion composed of these specks of living matter, which only await suitable conditions for growth and development. What intellectual light the careful study of such a sunbeam may throw upon knotty questions of vital importance to man.

4. Structure.

Small as these organisms are, they possess well differentiated parts, which are each, presumably, absolutely necessary for their existence as living things. We do not infer that structure is life, but there is every reason to believe that life is just as dependent on structure in these simple and low forms as it is in the highest plants or animals. Solution, separation of parts, can no more take place in the one than in the other, without destruction of life. Liquids, separated from solids, never possess, nor are possessed by, the life principle, whatever that is. Think of dissolving the body of a mouse in acids, and then, by proper chemical manipulation, collecting every atom of the original substance and reforming by this means a living mouse! There is, however, just as much ground for the supposition that this can be done with the mouse, as there is in the case of the minute things of which we now write. To be sure, there is not so much complexity of organization, but there is quite as constant a certain and characteristic structure on which life depends.

Bacteria, like other living things, are composed of cells; or, perhaps, it is better to say, each *Bacterium* is an organic cell. There is an outer wall or membrane closed on every side like the skin of a raisin, and within this envelope there is a plastic substance forming the entire contents of the cavity. Chemical reagents show that the outer membrane is made up of cellulose, the substance of

which wood consists, everywhere forming the framework of all plant structures. This, at first, is uniformly white, but becomes variously stained, as in the heart-wood of trees of different kinds. It is, except in peculiar states, insoluble in water, but swells and shrinks from its power of absorbing and again giving up this liquid. Fire destroys it, forming, with the oxygen of the air, carbonic acid and water.

The inner soft substance of the cell is protoplasm, which is even more common in higher organisms than cellulose; for while the latter is almost without exception confined to plants, the former is present in all living things, plants and animals alike. Taken by itself, it probably has a uniform composition in all organic nature; but it is variously mixed with other substances, rendering it difficult to determine the exact chemical components. Besides the carbon, oxygen and hydrogen of cellulose, it invariably has nitrogen, which cellulose does not have. Though usually semi-fluid, it also is insoluble in water. Heat coagulates, and thus destroys its functional activity—kills the organisms. Not the least instructive is the power of motion possessed by protoplasm. Its mass is often agitated by internal currents, made evident by little granules carried along by the stream. Sometimes these granules remain for a time at rest, then start off in an irregular line across the cell, rolling and tumbling on the way. These motions are not easy to see within most *Bacteria*, but are readily enough made out in some of the larger kinds.

This is the simple structure of *Bacteria*—a minute cell with an outer cellulose wall inclosing the protoplasmic contents. There are no organs or appendages, save in some, and perhaps all motile forms, there is at one, or at most two points, an exceedingly fine, hair-like appendage, to the vibrations of which the movement of the organism is attributed. This fine cilium or flagellum, as it is called, is a difficult thing to see, even with the best microscopic equipment and the most expert manipulation, partly on account of its exceeding fineness or thinness, partly from its rapid vibrations. Sometimes by introducing a weak solution of iodine, so as to gradually subdue the movement, the cilium can be made out when not practicable otherwise.

5. Reproduction and Development.

Bacteria increase by one dividing itself into two. There is no such thing as sexual differentiation, nor is there in the development anything comparable to the germination of a seed. Division is affected by the formation of a transverse partition or septum of cellulose across the middle of an adult cell, thus making two compartments, after which separation gradually takes place by the parting of the outer wall and the middle of the new partition with a rounding off of the contiguous ends; while, during the same time, each half grows to the size of the original whole. Thus one becomes two, each of the latter being in every way similar to the first. Under favorable circumstances this process may in some species take place within one hour, then in the course of another hour be repeated, and so indefinitely. Shorter periods for the

process have often been reported. If we pause to rationally comprehend this rate of increase, we shall soon be lost in the amazing numbers which in a little time spring from one. It may seem incredible, but any one may readily verify the fact that according to the rate of one division each hour the number from one after twenty-four hours will be more than sixteen millions, and after forty-eight hours nearly three hundred billions. Cohn has computed that *Bacterium termo*, (a very common species in putrifying organic matter) would at the end of twenty-four hours, at the above rate of increase, fill a little cube one-thousandth of an inch across each side; after forty-eight hours the solid mass would amount to about a pint; then of course at the end of another hour—since each would become two in this time—there would be two pints, in two hours four, in three eight, in four sixteen, etc., and such is the astonishing increase by this geometrical progression, that at the end of five days from the beginning the mass arising from one of these exceedingly minute creatures would be sufficient to fill completely full, or to equal in weight the water of the oceans of the world.

Incredible as this seems it is a simple calculation which any one can make on the supposition that the organism is one twenty-five thousandth of an inch in transverse diameter and twice as long, and that the number is double every hour. That nothing like this ever really occurs in nature for any consecutive number of hours, we need not be told; but this only shows the harmonious interaction of causes and effects among the sum total of forces and activities on our earth; it is not because this *Bacterium* under the assumed conditions does not increase at the marvellous rate stated, but because such conditions do not continuously exist. The limitations are fixed by the given supply of proper nutriment, the absence of harmful chemical compounds, temperature, electrical and mechanical agitations, the effects of other living organisms, etc.; nevertheless the computations prepare us for the acceptance of facts, which would otherwise be deemed incredible, and they aid us in the explanations of observed phenomena otherwise inexplicable. When it is known that a certain species may reproduce itself with anything like this rapidity, we need not wonder that individuals are found, after a short exposure of the nutrient substance, in innumerably great numbers; and, if there is any chance for one or more of such individuals to gain entrance in the first place, we need not resort to speculations concerning spontaneous generation, or transformation, to account for the multitudes subsequently found.

But some species seem never to grow or multiply rapidly, even under the most favorable conditions. They differ among themselves as do the species of the higher plants. Some varieties, for instance, of the cultivated radish may have two or even three generations in a season; while others require two years to perfect seed. Some weeds come to maturity in a few weeks and produce thousands of seeds, while an oak lives through the centuries.

In the process of self-division, complete separation may or may not take place. There is indeed considerable variation in this respect, even in the same species according to external and perhaps internal conditions. If, after the transverse dividing septum has been formed, further separation does not take place, the result is in a little time

a filament, made up of cells placed end to end, and either quite smooth and of uniform diameter, or more or less constricted at the joints, so as to be bead or chain-like. In this case, however, each link is really a distinct individual so far as its physiological functions are concerned, and life is in no way interfered with if they are mechanically or otherwise separated. In one genus (Sarcina) division appears to take place in two directions, transverse and longitudinal, so that little regular squares of cells are produced, four or sixteen being frequently seen associated together in order.

The individuals of certain species cohere together without order in a somewhat compact mass called *zooglæa*, bound by the glairy substance in which they are imbedded. But this is the case only in special conditions or states, for it is easy to see single ones free themselves from the immovable mass, and swim away in the liquid in which the whole are submerged. The zoöglæa mass may be the result of the multiplication of a single cell or those originally separate may become thus united.

Besides the method by division, several species are known to reproduce themselves under certain conditions by what are termed *spores*. The protoplasm of a cell becomes consolidated into a spherule occupying only a small part of the cavity. This afterward becomes free by the dissolution of the old cell wall, and, at the proper time, under the proper conditions, the spherule develops into a full sized cell like its parent form. The formation of such, so-called spores, usually takes place when the nutriment is nearly exhausted, or when not suited, either in kind or in the required state as to temperature, etc., to the regular growth of the organism. It is a method of self-perpetuation rather than multiplication. Still, in a few cases of which record has been made, more than one spore is produced by each cell. Touissant, of France, has seen within the cavity the formation of spore sacks (*sporangia*), each of which produced from three to six spores. It is often in the form of these all but infinitesimal spores that *Bacteria* are carried in the atmosphere. When produced in liquid they fall to the bottom after the dissolution of the old cell wall, and form, when numerous enough, a plainly visible, white sediment. In case the water is then evaporated, the sedimentary material becomes a fine powder, the particles of which readily float in moving air.

6. Vitality and Endurance.

Moisture is essential to the growth of *Bacteria*, but prolonged drying does not necessarily kill them. In the case of the species causing the blight of pear and other plants, they certainly lose little or none of their vitality by preservation during two years in the dry state on the point of a quill. Among those kinds producing spores, the adult organisms often do not live more than a few days or weeks, while the spores seem to absolutely defy time. Pasteur thinks he has shown that the latter retain their vitality in the earth out of doors for at least twelve years. After keeping in a sealed tube four years, some virus of splenic fever was sent from England to this country, where it was opened and used with fatal effect in inoculating animals. It has even been argued by some investigators that *Bacteria* never die, except as destroyed by fire or injurious

chemical compounds; and whatever may be the case otherwise, so far as age is concerned, this is true, for on account of their manner of propagation an individual does not grow old.

Each species is adapted to a certain best temperature from which variation may take place, within only very narrow limits in some kinds, or a wider range with others, (75° to 105° F.) None appear to be killed by cold, but their vital activities cease at given limits, never reaching below the freezing point of water. An artificial temperature of 123° F. has been tried without killing them. On the other hand not only is the limit of activity reached by increase of temperature, but death always ensues by exposure to a given but greatly varying degree of heat for different species. Spores immersed in the fluid resist for a time the heat of boiling water, but all adult forms are killed in this way. When the medium is alkaline a higher degree of heat is required to destroy life than when neutral or acid, and if the organisms are dry a still higher temperature may be withstood; 140° F. in water, fruit juices, vinegar, sour milk, etc., is absolutely fatal to such as ordinarily occur in these fluids. The highest temperature yet known at which any *Bacteria* are able to live and develop is 133° F.; this has been observed in an infusion of beans. But some spores are not killed, especially in alkaline fluids, by prolonged boiling, just as some seeds withstand a similar test. If either are softened by germination, they quickly succumb.

We make use of these facts in the operations of every day life, especially in the process of canning articles of animal and vegetable foods, scalding cooking utensils, etc. The heat kills the *Bacteria* present.

Various substances destroy *Bacteria*, or at least prevent their propagation in nutritious solutions. Of these, the best known and most widely used are carbolic acid and quinine. Several others are more deadly to the organisms than these; but they either have some objectionable properties, or have not been so generally introduced. Grace Calvert asserts that some *Bacteria* can live in pure carbolic acid, but there seems to be some mistake in this, at least for ordinary species, for hundreds of experiments prove that none are developed in a liquid containing one-half per cent. of this antiseptic.

The following table, from experiments by M. Jalan de la Croix (Revue Scientifique, Feb. 4, 1882), shows the number of parts of water to one of the substance named which barely permits the development of *Bacteria* in infusions of meat. For instance, if thirty parts of water are mixed with one of alcohol, organisms may infest the mixture; but if twenty-nine parts of water are used to one of alcohol, *Bacteria* do not develop, and the mixture does not ferment:

Alcohol	30
Chloroform	134
Soda biborate	107
Eucalyptol	308
Phenol (carbolic acid)	1002
Thymol	2229
Potash permanganate	3041
Picric acid	3041
Borated soda salycilate	3377

Benzoic acid	4020
Etherial oil of mustard	5734
Sulphurous acid	7534
Alum acetate	7535
Salicylic acid	7677
Mercury bichloride	8358
Lime hypochlorite	13092
Sulphuric acid	16782
Iodine	20020
Bromine	20875
Chlorine	34509

From my observations these results seem to be trustworthy, though others very dissimilar have been published. It is not a sufficient test to observe through the microscope the effect that any substance has upon the motions of *Bacteria*. Sometimes the addition of pure water causes their motions to cease, and sometimes molecular oscillations, not always easy to distinguish from those of life, continues after the organisms are dead. This has no doubt been a source of error in some of the accounts given to the press. The above figures were arrived at, by trying more and more water to one gramme of the substance until at last *Bacteria* developed and putrefaction set in.

It should be said that it is well nigh impossible to kill *Bacteria* in the air, by any kind of fumigation, except in a very thoroughly closed space, like an air tight vessel or box. A mistaken sense of security often exists when the atmosphere of living rooms, sick chambers, etc., are pervaded by the odors of some supposed antiseptic material. These floating "germs" can at least withstand as much fumigating as any human being, and usually very much more. On the other hand, much can be done towards destroying noxious *Bacteria*, or preventing their growth and propagation, by impregnating liquids and solids by proper amounts of such destructive agents as are enumerated above. Experiments are now in progress of treating the carcases of slaughtered animals with antiseptics not poisonous to man, for the purpose of sending fresh meat without ice across the ocean or other similar distances, and the results give much promise of success. A white powder is offered for sale to keep fruit without canning, and it appears to have virtue enough to really accomplish the result claimed without detrimentally affecting the food. (Compounds of boracic acid). There is, no doubt, much to be gained of practical utility in this direction.

7. Nutrition.

Bacteria absorb their food by endosmosis through the cellulose coating of their minute bodies. The nutrient material must therefore be in a liquid state as well as of the kind and strength suited to the specific organism. Like more highly organized living things, each species has its own peculiar kind of food, without which development does not take place. As a cat would starve on hay, and an ox on meat, so similar differences are found among these inhabitants of the microscopic world. But all require organic food derived from the bodies of higher plants or animals, though it has been sufficiently proved that at least some kinds can take the required

nitrogen from inorganic sources. *Bacteria* could not live alone on the earth; they are destroyers, not up-builders; they pull down and decompose material prepared by the assimulation of other vitalized workers.

Some kinds are rigidly confined to dead matter, others develop and grow at the expense of living plants or animals, causing little or no inconvenience or even conferring real benefit to the latter; or instituting varying degrees of discomfort, injury and disease.

The waste products of their physiological processes are as varied, after their kinds, as their food, acids, alkalies, gases, liquids, fragrant, ill-scented, &c., but always of simpler chemical composition than the original, until at last, through perhaps the consecutive action of several species, the elemental state is reached. Thus in the fermentations of solutions of sugar, alcohol is given off as a waste product by the "yeast plant" (sacharomycetes) and the diluted alcohol ferments through the effects of the "vinegar plant" (mycoderma), and in this case vinegar is the substance thrown off, while this in turn decomposes in a similar manner by other agents, into carbonic acid and water.

8. Origin.

The question, "Where do *Bacteria* come from?" that is, what is their original source, is sure to press itself for answer. This answer is by no means an easy one to give with positive assurance of correctness. We have already seen how they are reproduced and the rapidity with which they may multiply, as well as something of the modes by which they are disseminated; but all thinking persons wish to know how or whence the first ones came into existence.

Upon this question there have been many experimental inquiries by the ablest investigators, and many theories have been propounded by those most competent to formulate them, as well as the crudest of unsupported hypotheses by untrained minds. Among all these opinions we may select three as worthy of special notice:

1st. Spontaneous formation under proper conditions form inorganic chemical elements or compounds. 2d. Transformation from other living organisms or their parts, and 3d. Direct creation by the great Author of all things.

It would require too much space to even sketch in this place the arguments which have been advanced in support of each of these theories by thorough scientists. The voluminous literature on the subject shows the interest that has been felt and the real warfare of words that has been waged by contending supporters of their own or others ideas.

But no one without personal bias can carefully review this literature to-day, with the results of experiments clearly in mind, without concluding that the first and second have not been proved. From a philosophical stand-point the first is highly plausible, since these organisms are admittedly among the lowest living things. If spontaneous generation takes place anywhere in nature, we should look for the phenomenon here; but, while certain experimentors have supposed their results showed the theory true, others still more expert have uniformly pointed out the fallacies of such experiment or deduction, so that up to the present time we are bound to

say the facts known disprove rather than prove the hopothesis. The second has not been so fully and conclusively studied, yet the most searching investigators have not been wanting, with, upon the whole, negative results. No untrammeled scientist conversant with the entire subject as now known, admits the proof of the origin of *Bacteria* by transformation of the parts of other plants or animals, however close and constant may be the accompaniment of the one with the other. In this statement we exclude the idea of evolution during centuries of time, the change taking place by numerous unrecognizable differences; for, to our mind this belongs under the third hypothesis. We have, therefore, just the same scientific information about the origin of *Bacteria* as we have about that of other living things, man included. Whether we hold that the Creator fashioned each species in the beginning by a direct act, or accomplished the same by instrumentalities, working through the ages, makes no difference in the question before us. We are forced to refer the origin of *Bacteria* to the same Power to which we attribute the origin of man. It is certain that these minute organisms have existed in very closely similar, if not identical, forms as at present, from remote antiquity, as is proved by the discovery of fossil remains, as well as the evident effects produced in the past ages of the world, according perfectly with those now known to be the results of their action.

It must be admitted, however, that in the progress of individual development some kinds pass through different forms, which have been supposed to be characteristic of species, and that, retaining the same form, the physiological effects may vary through the prolonged influence of certain external conditions. Thus an individual cell may be spherical, then oblong, cylindrical, and filamentous in regular sequence of growth, though each of these forms in other species may be characteristic and unchanging. And a species ordinarily living in an infusion of dead vegetation may, by a slow and gradual change, become capable of surviving and multiplying in the blood of living animals, whereas a sudden transfer from the one to the other medium would have permitted no such results. But man himself is capable of becoming adapted to as remarkable changes. We say we become habituated or acclimatized to things and conditions, as of eating arsenic and of dwelling in the malarial regions of tropical countries. No greater changes than these are known in the life history of *Bacteria*, only that it requires less time for the modifications to take place; and this should be anticipated from their rapid succession of generations.

9. Place in Nature.

Bacteria are certainly living things, hence, according to the ordinary thought and classification of objects, must be either plants or animals. Formerly spontaneous or self-caused motion was held to be characteristic of animals as distinguished from plants; and, as many *Bacteria* are seen under the microscope to move freely and in some cases very rapidly to and fro, hither and yon, they were at one time unhesitatingly classed as animals, as indeed most unscientific observers would at once pronounce them now when viewing them for the first time by the aid of a powerful magnifier. But

the fact is, self-caused motion is not confined to animals. Really all plants more or less possess this power. A seedling causes its stem to turn upward and rootlet downward through internal forces, and afterward the growing parts bend to or from the light, as every one has observed. Leaves quite generally assume different positions day and night; flowers open and close, twining plants revolve in such manner that the free end sometimes sweeps a circle of four feet in diameter about the supporting object, tendrils twine in some instances fast enough to be plainly observed by any one possessing good eyes and a fair share of patience. It is true that all the higher plants are fastened to their supporting substance, and are incapable of roaming from place to place; but the lowest members of the vegetable kingdom are not thus limited. In some conditions at least the latter move as freely as any animals, not simply through the controlling influence of external agents, but from forces wholly within themselves. Such motile plants are all microscopic in size, but no botanist or zoölogist hesitates to pronounce them true plants, having all the fundamental characteristics of members of the vegetable kingdom.

So, freedom of motion itself, however striking it may be, is not sufficient cause for classing *Bacteria* with animals. But it has been before stated that the outer coat or wall of the organisms is composed of cellulose, and this is peculiarly a substance belonging to all plants, and, with very rare exceptions, to any animals. It has also been mentioned that *Bactaria* are capable of taking the nitrogen required for their nutrition from inorganic salts, and this is alone characteristic of plants. There are no exceptions on the animal side.

These and other reasons have in recent times caused all naturalists who have made these objects a special study to pronounce them plants. There is no difference of opinion among proper authorities, if the choice is limited to one or the other of the two great kingdoms of animated nature; but Haeckel, a German scientist, has proposed to take the lowest forms of both these kingdoms and constitute therewith a third, called *Protista;* in this case the *Bacteria* would be called neither plants nor animals.

As plants, the *Bacteria* certainly occupy a position at or very near the bottom of the scale. They are among the simplest in structure of living things, and include among them the smallest objects in nature, animated with a spark of that vitality whose nature and essence is as unknowable in them as it is in the being created in the image and likeness of God.

There is a further and undecided question as to whether the *Bacteria* belong to the *Fungi* or to the *Algæ,* two great divisions of the vegetable kingdom; but this depends solely on the definitions given to these groups. If greater prominence is given to form and habitat, they more nearly resemble the Algæ, or sea-weeds; if physiological functions are decisive, then the *Bacteria* are unquestionable Fungi. This is now less important, since in a strictly natural classification it is undecided whether or not the great groups known as Algæ and Fungi are entitled to remain as such. Probably not; in which case the term *Prototypes* will almost surely be

uniformly anopted to designate the lowest division of the vegetable kingdom, and in this the *Bacteria* will presumably occupy the lowest place under the ordinal name of *Schizophytes*, a word now in use, and meaning dividing or splitting plants.

PART II. EFFECTS OF BACTERIA.

1. Fermentation and Putrefaction.

Until within recent times it has been supposed that organic matter, dispossessed of the vitality to which it owed its existence, was naturally very unstable in its chemical constitution, and that its tendency was to go back to the elementary inorganic state, through the operations of simple chemical affinities. The soft parts of animal bodies have been considered especially liable to change after death; indeed this is now so common and constant a phenomenon that it is looked for as a matter of course, unless express provision is made to prevent it. We are surprised, when told that during the summer season the fresh flesh of buffalo on the western plains remains sweet and perfectly good until dry in the warm open air. The astonishing story is repeated again and again that the bodies of the woolly elephant of ancient Siberia have been taken out of the ice, in which they perished long ages ago, yet with flesh still so fresh that dogs feed upon the carcases.

The scrupulous care which we are obliged to take to avoid ill consequences to butchers' meats, makes these exceptional instances of preservation in nature really wonderful to us. We say the law is for such material to putrify and decompose, for milk and cider to sour, for the expressed juices of fruits to ferment, and the fruits themselves to decay. A pile of green herbage heats and rots, and wood exposed to moisture gradually loses its strength and disappears to help form vegetable mould.

These various changes, to which all dead organic matter is subject, going on about us so abundantly and so constantly make up a large part of the physical phenomena of the world; we expect them to occur and recur with the same certainty if not the same regularity of time or rate as the fall of unsupported bodies to the earth, the planetary changes and the succession of the seasons. We just as much expect fresh meat to spoil in warm summer weather as we do enkindled wood to burn. The wine maker counts just as certainly upon the fermentation of the juice of the grape as the engineer upon the pressure of superheated steam, though neither the one nor the other may stop to consider the philosophy of the phenomena with which they are respectively confronted. They have ascertained by experiment the governing conditions, and proceed with the confident assurance of what has been, will be.

Now, to those who herein read for the first time that dead organic matter has in itself no such tendency to spontaneous change, that, subject, as in nature generally, to all the activities of pure air, and

pure water and to these alone whatever the temperature, dead fish and flesh will not become ill scented or putrid, that milk and blood will not change from the condition they have when drawn from the living animal, that a heap of green or wet grass will not heat and rot, that moist wood will remain as durable as granite, and that the substances of their own bodies after life has departed are as incorruptible as gold,—these words may seem foolishness and upon the face of them absurd; yet this is the teaching of science and is the unavoidable conclusion from many instructive experiments. When the whole facts are known, the wonder is rather that the flesh of slaughtered animals so surely putrifies with us, not that as a rule fresh meat exposed to the pure air of the western plains should remain forever good. These facts could never have been known without the aid of the microscope, and since this wonderful instrument is of modern invention the knowledge set forth in the following pages has been gained alone by modern investigation. If there is still doubt about the matter as a general phenomenon, it is only because new ideas are slowly accepted; if there is dispute among the informed as to details of the process, it is mostly because so few really competent experimenters have yet undertaken the delicate but fruitful work.

The marvellous progress of modern science is based on the well-grounded idea that every effect has an adequate cause, and that these causes, in the material world at least, are subject to undeviating law. If a body moves, the force is sought, and usually not in vain, which produced the motion. If change occurs, a competent agent is at once supposed to be instrumental in its accomplishment. Students of nature are not content with passing anything as mysterious which can be brought within the domain of knowledge, nor with accepting as a fact anything which does not fall within the reign of natural cause. Possessed of this spirit, and provided with the necessary instruments and means, the subject before us could not escape investigation by the quickened intellects of recent times. The result is, after much conflict of opinion and difference of interpretation, the established fact, that *the natural changes taking place in non-living organic matter, are all due to the vital activity of living things.* Some of the usual results of life-forces may be accomplished in the chemist's laboratory, but the processes and conditions there and in nature are entirely different. What life is, and to what its particular powers are due, we do not know; but we do know its effects, and these are as pronounced and unique in the natural destruction as they are in the original upbuilding of organic matter. Life manufactures, and life in turn pulls to pieces and destroys. An organic body is not a watch, which, having been wound up, runs down of itself; but it is a splendid temple, the rich material of which, accumulated from all lands, would require the same as its original freighting for its redistribution. But the low, microscopic organisms are by no means alone, if they act in any sense different from other vitalized beings, in the work of destruction. Every living creature is continually destroying itself, reducing, through its physiological and normal processes, the solid parts to liquids and gases, from the organic to the inorganic. This is the waste which all plants and animals suffer as long as life continues.

After death waste goes on in a different way, through the physiological and normal activities of other living beings, and the more noticeably because there is no repair.

Among these latter destroyers there are very many kinds of animals and plants. Indeed all animals are included in the list, and the digestion of food with them is always a work of destruction, as is readily understood. There are among flowering plants certain kinds which are also purely destroyers—the dodder or golden thread (*cuscuta*), found sometimes in tangled profusion on weeds, flax, clover, etc., is common with us. But it is to the *Fungi* that we must look for the principal agents, of the plant kind, which act as pure destroyers of organic matter. These degraded plants live solely on the accumulated and organized products of other plants and animals, assimilating a portion for the architecture of their own bodily structure, and exhaling another very considerable part as waste, in one shape or another, but ultimately as carbonic acid and water, two prominent ingredients in the original nutrition of green-leaved plants. Nitrogenous compounds, as ammonia, nitric and butyric acids, are also given off in the destruction of most organic matter. An old log in the woods having no tendency to decay, and resisting much better than iron the slow corrosion of the oxygen of the air, tumbles to powder under the digestive power of insects, toadstools and *Bacteria*, each kind working differently, but accomplishing nearly the same result.

It has already been said that in their physiological effects at least the *Bacteria* are *Fungi*. Their food is organic, elaborated in the first instance, if not direct, by green-leaved plants. Their function is to destroy, like that of other colorless plants and all animals. In this process of destruction peculiar and characteristic effects are usually produced by each species, and in very many cases each species is limited to some special kind of food material. In this there is nothing new or strange, for the law holds good throughout all nature, among all animals and all plants.

If, now, we remember the facility of distribution which these minute organisms enjoy, their vital endurance and their wonderful powers of reproduction, we need not after all be surprised that milk, wherever left exposed under the proper conditions of temperature, etc., becomes sour through the agency of a living organism developing in, and feeding on, some element or elements of its substance; or that fresh meat becomes ill-scented through the respiration of similar living things, acting in a similar way. Keep these destroyers out, and no such results would occur. In wide arid regions where there is but little material on which they may develop, their uniform presence in the air or on the surfaces of solids, cannot be expected, and this is the secret (now a secret no longer) of the fact that meat keeps in such places without putrefying. Since the white man has made his habitation in the West where the old hunter used to expose his jerked buffalo with impunity to the warm sun and air, this can no longer be done with butchered flesh. But it is still found possible on these wind-swept plains to keep meat fresh for a considerable time by sticking it on poles high above the earth, above the usual dissemination in these places of living organisms. The same thing is true

on high mountains, though the warmth of the sun may be fully sufficient during mid-summer for the manifestation of all kinds of life and of rapid changes in putrefactive substances.

Among the destructive alterations of organic matter, those known as fermentation and putrefaction are peculiarly the effects of certain species of the low plants of which we write. Because the latter are so minute, they are not commonly known to be present, hence the popular idea that the processes are spontaneous, due to the nature of the material in which they occur. The French Count, Appert, early in the present century, working under the idea that the oxygen of the air is the active agent in these destructive changes, devised the method now so largely adopted of hermetrically sealing fruits and meats. He fortunately hit upon the plan of expelling the air by heat, and of closing the vessel while the contents are hot. The result is what he hoped for, the indefinite preservation of the material. This explanation, though the only one known to many to-day, is absolutely false, as has been clearly shown in several ways. It is by no means necessary to exclude the air; it is only essential that living things adhering to the surfaces of the fruits, etc., and often contained in the air, be prevented from developing and multiplying in the substances. The heat destroys such as are in the vessel either on its own interior surface or on the fruit, and the closing while hot prevents the entrance of fresh germs. A can of such preserved material opened in summer on the house top in the country might not spoil for many days or weeks. In such an experiment care should be taken to keep the article to windward of the person for obvious reasons. In a warm time during winter success would be much more certain. Two years ago I found that milk taken direct from a cow in a heated glass fruit jar, with the simple precaution of previously washing the udder and adjacent parts and closing the jar as soon as possible, often kept sweet and fresh many times as long as that left open in a clean milk room.

I now proceed to rehearse the results of some more careful and conclusive experiments which, it must be admitted, fully substantiate what has been said about fermentation and putrefaction being due to living organisms instead of to the air or any quality of the experimental material.

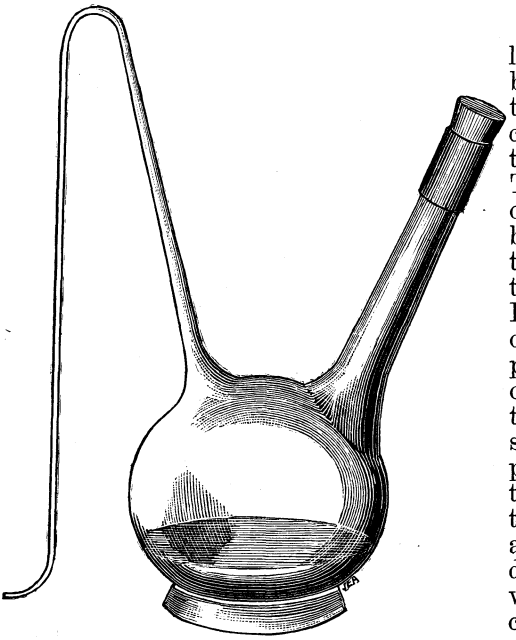


Figure 1 represents a little glass flask, invented by Pasteur, of France, for the purpose of making pure cultures of certain kinds of these minute organisms. The drawing was made from one of several in actual use by the writer, and made at the chemical laboratory of the Industrial University. It will be seen to consist of a little bowl of the capacity of about one fluid ounce, and from this arise two tubes, one of which is surmounted by a short piece of rubber pipe, containing a glass stopper, the other long drawn out and bent downward, the descending portion being very fine, with an internal continuous cavity about the diameter of a medium sized horse-hair. The end is left open.

For our purpose we may take any fermentable or putrefactive infusion, as of hay or chicken broth. Filter to remove the solid particles, that we may better observe what does or does not take place, and fill the bowl of the flask through the stoppered tube.

We now hold the flask over a flame until the fluid boils, and the steam passes out of the larger tube, which we then close, having previously passed the stopper through the flame. The steam is permitted to rush out of the fine tube for a little time, after which we hold the fine open end in or just above the flame until the steam within the flask is condensed by cooling and the inrush of air ceases. We have now only to set the flask aside and watch results. If any change takes place, as a skum forming on the surface, a mouldy growth on the glass, or a sediment settling on the bottom, it can readily be observed; if not, we may see that the clear liquid continues limped and pure. Let us examine closely the conditions, supposing the temperature to be that of warm summer weather. We use a fluid which, freely exposed to the air or enclosed in a bottle without subsequent heating, would rapidly ferment or putrefy, becoming turbid and milky, with (if soup) a slimy scum forming on the surface, and withal an odor so characteristic that we shall know well enough what it means. By boiling in the flask, any living organisms in the liquid or attached to the interior of the vessel are killed. And by holding the minute opening in the flame—taking care that the glass is not melted—until after the condensation of the steam by cooling, there is afterward no strong inrush of air through the open tube. Now, all living things, no matter how large or how small, have solid parts, and are really heavier than the air, so that however minute, they cannot float in the latter, except as

swept along by currents; hence, though by every alteration in temperature, without or within, there will be slow interchange of air, the minute solid particles of the external atmosphere are not likely to be carried up the fine tube and over into the liquid, which is therefore exposed to pure germless air. I have now such a flask, filled nearly two years ago with filtered chicken broth which is as clear and sweet as when first made, and this has been kept on a shelf in the laboratory, where the temperature has been very favorable to putrefactive changes, and where, from the use of the room, the air is unusually laden with organic dust. On the same shelf are other flasks of similar kind, some of which, after keeping for some months in the condition of the one described, have been unstoppered for a few minutes, and then closed again, with sure putrefaction as the result. Sometimes simply shaking is sufficient to start this process, showing well enough the preservation was not due to any want of susceptibility of the liquid to such change. If, however, we take the precaution to hold the larger tube over a flame, we may open and close it without such results, and in this way we may from time to time microscopically examine the liquid by taking a drop upon a previously heated glass rod. While the liquid remains limped and sweet, no organisms are found, but they always swarm in profusion when visible changes take place.

A successful experiment of this kind seems to prove two things: 1st, that the potential factor in fermentation resides neither in the substance itself nor in the pure air; 2d, that organisms do not spontaneously develope from germless material.

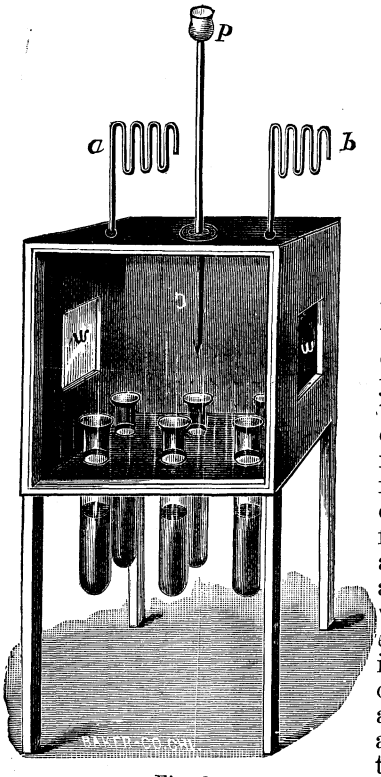


Fig. 2.

Tyndale, of England, has taught us another mode of experimenting to gain answers to the same questions. He constructs a wooden box with a back door, glass front and side windows, and passes through the bottom several test tubes, air tight. Through a hole in the top fitted with a sheet of India rubber and a stuffing box of cotton wool wetted with glycerine, a long glass rod with a funnel above may be thrust to fill the test tubes, and two sinuously bent glass tubes pierce the top for the admission of air without dust, as explained in the account just given of Pasteur's flask. The interior surfaces are moistened with glycerine and the box closed. By passing a beam of sun, or brilliant artificial light, through the windows it can be readily ascertained when the floating matter has settled and the air is pure, after which the test tubes are filled with putrescible liquid, which is now boiled by heat applied externally. We notice that the boiled infusion is freely exposed to the air of the box as well as to the outer atmosphere through the bent tubes, and that the only precaution taken is to allow time for all minute solid particles to settle in the still air of the chamber to whose moistened surfaces they adhere. Hundreds of tests have been made in this way by Professor Tyndale with the most satisfactory and positive results, with very many kinds of putrescible substances, as natural animal liquids, infusions of flesh, the viscera of animals, of fish and of vegetables. The perfectly sweet and limpid filtered infusions remained in this condition for months, while outside of the moteless box in the same room they became putrid and offensive in some hours. It was sufficient at any time to open the back door of a box, if but for a moment, to secure these latter results in the experimental test tubes. In the clear, unchanged liquid living organisms were never found; in the ill-scented turbid ones, these always existed in countless numbers. What can be more instructive? What better demonstration could we wish of the non-occurrence under usual circumstances of spontaneous generation of living organisms, or of the stability without these of organic substances?

2. Diseases of Plants and Animals.

From the earliest times many of the diseases of man and of the domesticated animals have been known to be contagious, *i. e.* capable of being transmitted from a diseased to a healthy subject, while some that are now known to be propagated in this way were

looked upon as peculiar visitations of Providence for supposed sin—the fact of the contagion not having been observed. There have also been from earliest history many speculations as well as careful studies, upon the nature of the poisonous or contaminating principle, and physicians, ever since their art has been practiced, have endeavored to find out remedies by experiment. Among the diseases of the human skin that is happily much less prevalent now than formerly, the *itch* was the subject of extended and warm controversy from the twelfth to the eighteenth century among Arabian, Italian, French and German physicians and scientists. Some held that want of personal cleanliness was the sole cause and that the disease might spontaneously appear at any time and place, given only the proper conditions. Others found a minute, living, crawling, egg-laying inhabitant of the diseased skin, and attributed the ill effects directly to its work. Then came learned disputes as to whether this living thing did or did not originate from the filth, and whether it came as a consequence simply, or was verily the exciting cause of the disgusting malady. The literature upon the subject is very full, and if in those days they had possessed our aptitude for putting things in type, it would have required a library of books to contain the discussions.

Practicing the experimental method, some investigators at last put the living creature, separated from the *debris* of the diseased skin, on their own bodies, and watching its operations, established its true parasitic nature.

The agent, a mite, popularly called an insect, is propagated only from eggs laid by parent individuals, and thus maintains its specific identity. Its life-history having been satisfactorily made out, and its mode of operation fully made known, it is no longer a subject of dispute; but the history of the controversy is a valuable one in our present studies. Knowing the facts, we now smile at the absurdities of the opinions held, and the foolishness of the supposed proofs upon which these opinions were founded; yet these were not cruder nor farther from the truth than are many of the speculations and incredulities of our times concerning "diseased germs."

While an illustration of this kind cannot be taken as evidence in the case of bacteria, the same questions are now asked about, and the same objections made against, these latter organisms as the *cause* of disease. Yet careful investigators are to-day as able to handle bacteria, to see their shape, observe their manner of increase, ascertain their proper food material, and find out the substances inimical to their lives, as were Abenzoar and Bonomo in their time to similarly study the itch mite,—thanks to the improvement of the microscope, more than anything else, except the general acceptance of the experimental and inductive method of study.

The fact is, those competent to judge, now agree in holding that some severe contagious diseases of man and animals are directly due to bacteria, while many scientific investigators, whose abilities cannot be questioned, and who have abundant facilities and opportunities to learn and to know, claim that all diseases, readily communicable from the infected to the healthy, have their origin in the activities of these living organisms, and this opinion is certainly growing into wide, if not universal, acceptance. Other diseases, as

fever and ague, not understood to be infectious or contagious, are also believed to be due to certain kinds of the same things.

Herein lies the greatest interest and highest importance attributed to these wonderful but excessively minute denizens of the, to common eyes, invisible world; and herein, more than anywhere else, rests the hope of attaining a scientific basis for medical practice, as well as a rational adoption of preventive measures against the ravages of disease. It will not do for the hobbyist to assume that all the ills that flesh is heir to can be traced to the corrupting work of "disease germs," for, as has been before pointed out, these minute things have no life functions which strictly separate them from other plants and animals. Their physiology is our physiology; they assimilate food material as we do, and, by virtue of this power, live as we live. The delicate and complicated machinery of the higher animal bodies may be put out of order in many ways, and by want of nature's harmony the normal, vital forces themselves may be the agents of disease.

But while there is no toleration for the hobbyist, those who have not investigated and cannot investigate for themselves should not hesitate to accept the testimony of capable specialists, when the latter find reason to assert that such and such a disease is due to the microscopic mischief-makers Their bacteria minuteness no longer prevents the demonstration of their presence, the tracing of their development, the detection of the actual effects and the experimental testing of results. There is now in certain cases just as good evidence that bacteria cause disease as there is that hawks destroy chickens, and the evidence is as inductively rigid in the one case as in the other. Even without microscopic examination, there is good reason to assert that the contagious principle, whatever it is, *grows*. Any chemical poison decreases in virulence by diffusion in a mass of inert matter, and soon loses its effectiveness; but it is the special characteristic of the poisons of which we write that a minute quantity soon infects the whole system of a large animal, and then the smallest drop of fluids from its body is sufficient to give origin to the disease in another animal and so on perpetually. Increase has taken place; there must have been growth; only living things grow; the microscope aids us to see what this living thing is; why should we doubt!

It is true that Dr. Lionel Beale proposed a theory of disease germs, which accounts for increase by assuming that degraded, yet not dead, parts of the animal body itself constitute the true contagion, and that every such living but degraded portion has the power in some way of over mastering the healthy—a speculation which, though brilliantly conceived and sustained at the time, has not been definitely supported by later investigations, nor held with assurance by any other authority, known to the writer; though, from what has just been said, the process is neither inconceivable nor *a priori* impossible, perhaps not even improbable. The only question is, "Do facts prove it?" There are indeed some experimental facts which seem to favor the idea, viz: the transmissibility of inflammation produced by chemical or physical means upon inoculations with the exuding serum. It may be said however that even in this there is the possibility of independent organisms being the real virus.

The first septic disease well worked out was that of *pebrine*, an infectious malady of silk worms in France. In 1853 the production of coccoons was 57,000,000 pounds avoirdupois, and had doubled during the preceding twenty years with every prospect of continued increase; but during the next twelve years, owing to the ravages of the disease mentioned, the production fell to 9,000,000 pounds, a loss in 1865 alone of twenty million dollars. During those twelve years of national disaster, the disease had been seduously studied by all the scientific and professional skill of the times so far as the light of pathological knowledge then attained permitted, without practically beneficial results. In this state of things Pasteur was besought by the Minister of Agriculture to undertake the investigation, though this scientist had no special qualification for the work, except his natural talents and his acquirements through studies on the origin and effects of the micro-organisms in fermentations and putrefactions. Great numbers of minute corpuscles had been seen some years before in the bodily tissues of the diseased caterpillars, but no one attached any importance to them. Pasteur at once turned his attention to these microscopic bodies, proved them to be living organisms, studied their propagation and mode of development, became able to distinguish infected from healthy eggs, and in September 1865 communicated his results to the French Academy of Science. His labors met with inattention or derision, so novel were they, and contrary to the learning of the time. To convince the skeptical and arouse the heedless, he selected fourteen lots of eggs in 1866 and wrote out what would be the fate of the moths hatched from them in 1867. These predictions, placed in the hands of a public officer in a sealed envelope, were exactly fulfilled in twelve of the fourteen cases, and produced the expected effect. His instructions were obeyed and France rapidly regained her great silk industry—one of the great triumphs of practical science in our triumphant century, and the foundation of an entirely new system of research in preventive and curative medicine.

Guided and profiting by Pasteur's former studies, Lister, then of Edinburgh, since of London, began in 1865 to perfect a system of anti-septic surgery, which, as introduced by himself and others, has been the means of inestimable progress in this difficult art, saving life and limb, as well as untold suffering to mankind. Unfortunately, either from the want of sufficient information or from placing too much stress on certain details, doubts are entertained by some fair-minded professional surgeons as to the correctness of the theory, though not upon the real progress that has been made. There seems good reason to believe such doubts will rapidly pass away, and that still further profit will be secured in the practical application of scientific knowledge. It is well known to veterinary surgeons that animals may be castrated by a sub-cutaneous rupture of the spermatic cords, followed by the death and absorption of the testicles, without mischief to the animal, provided the epidermis remains unbroken, but this provision is imperative. Gangrene is sure to follow if the exterior is punctured. Flesh bruises on our own bodies do not suppurate under similar conditions, and wounds made with a truly clean instrument heal by "first intention," if immediately closed and bandaged in such manner that living organisms

are excluded. This result is more certainly assured by the proper application of an antiseptic dressing, as of glycerine, in which a small amount of carbolic acid has been stirred.

The etiology of no infectious disease is now so well understood as that known as "splenic fever," "anthrax" or "charbon" of the domestic animals and "malignant pustule" in man. It is said, between 1867 and 1870 over 56,000 horses, cattle and sheep, and 528 human beings perished from this alone in a single district of Russia, while the annual loss of live stock in France has been millions of francs. This is now practically subdued by prevention of infection and by vaccination, the history of which reads like a romance. The contributions thus made to medical practice opens up boundless visions of future welfare to man. Jennerian vaccination against (for ?) small-pox was the result of an acute but fortunate observation, one almost might say a lucky coincident; but Pastorian vaccination, as we may properly term it, is the outcome of methodical and precise scientific research, gaining knowledge step by step and reaching new facts by logical induction from the known. To this progress there have been many contributors, but among them it is not unjust to mention Koch, of Germany, and Pasteur, of France; the former for his splendid studies on the cause, the latter for the introduction of a practicable remedy, now adopted on a commercial scale in France and Austria.

The terrible disease is thoroughly known to be due to the inimical activities of a specific organism, *Bacillus anthracis*, described in another part of this paper. Within the last few years certain researches have been published which seemed to demonstrate that this was a physiologically varied form of a species of the same genus common in infusions of vegetable substances, as of hay; but very recent investigations make any such transformation questionable.

Pasteur's vaccination material is obtained by prolonged cultivation of the deadly Bacillus in a decoction of animal flesh kept at a certain temperature, in which the organism multiplies rapidly, but progressively loses its virulence. At the proper stage, the liquid swarming with this particular microphyte is used for the inoculation of animals which scarcely, or not at all, suffer in consequence, but are thereby protected from the virulence of the dreaded parasite in its usual condition, bringing almost certain death within twenty-four to thirty hours.

As an experimental illustration, Pasteur and his co-workers made a public test, at the request of a provincial agricultural society, and before a large assembly of interested persons and experts. Fifty sheep were taken from a flock, and from these twenty-five were ear-marked and vaccinated, May 3, 1881. This was repeated on the 17th of the same month. In the meantime the fifty sheep were kept together in the same flock, under the same conditions and influences. May 31 the whole fifty were inoculated with strong virus, and the sheep again turned loose together. Pasteur's predictions as to the result were fully verified the following day—twenty-three unvaccinated sheep being dead at two o'clock, and the two other during the afternoon, while the twenty-five vaccinated animals remained in perfect health, save that one purposely receiving an extra dose of the strong virus was sick for a few hours, then recovered.

Such satisfactory experiments having been often made, thousands upon thousands of domesticated animals have been vaccinated during the spring and summer of 1882, with material furnished by the renowned investigator, and again the financial interests of France owes to her illustrious son and to science a splendid recompense of reward.

Nor is the end reached here. The successful study of this disease and the production of a safe vaccination virus, will no doubt lead to similar results for other diseases, and not improbably furnish a scientific basis for that already practiced upon human beings as a preventive of small-pox. The fact is, a study of the disease of fowls commonly called cholera, helped in working out that of splenic fever, and especially led the way to the preparation of the vaccination material as now used. This disease of the domestic fowl occurring on both sides of the ocean is really of like nature, but want of space precludes further notice of it. Suffice it to say that it is readily transmissible, either through external puncture or wounds, or by taking the parasite with the food. This fact alone should soon lead to measures for its extermination.

In our own country, among other studies of this kind, much has been learned about yellow fever, undoubtedly due to a specific organism not yet satisfactorily determined; about diphtheria, in which the minute but dangerous enemy has been well recognized and carefully studied; about several forms of septicæmia or blood poisoning; and especially about a prevailing disease of swine ordinarily known as "hog cholera." Though "a prophet is not without honor save in his own country," let us hastily review the facts ascertained by Drs. Detmers and Law in regard to this last-named malady.

Hogs were entirely exempt in the United States from the disease until quite recent times, and though the original infection and the spreading from the first locality was not observed, many facts are known concerning its introduction in given areas and its subsequent mischief, where swine kept under the same conditions were robust and healthy before. Numerous speculations were made and theories advanced to account for the plague. By some it was attributed to the diet (too exclusively corn), by others to filth and unhygienic surroundings, and by others again to degeneration from improper breeding, etc.

The gentlemen named above, with others, were appointed by the Commissioner of Agriculture of the United States to investigate the disease, and, provided with the requisite means and apparatus, working separately, they satisfactorily proved the infectious character of the devastating malady. A fraction of a drop of the fluids from a diseased animal, placed beneath the skin of one in health by an inoculating needle, produced in a few days the characteristic affection, as did the diseased parts given in the food. They found by hundreds of post mortem examinations the lesions produced, and the course and progress of the injuries. They also found constantly present a specific organism, and thoroughly studied its morphological and physiological characteristics. They cultivated it outside the living body, in harmless fluids, and by further inoculations and examinations proved its direct agency in the production of the observed results. They showed how this organism was liable to be

transported by infested animals, sometimes other than hogs, by water-currents, and, under certain limitations, through the air; they found under what circumstances it was naturally destroyed, and how preserved, and they succeeded in showing what preventive measures could be used through general management, medicinal treatment and vaccination. It was my good fortune to witness many of the experiments of Dr. Detmers, and can personally vouch for most of the above results, making, for myself, conviction irresistible, that the immediate cause of the disease is none other than the living organism always found in the blood and excretions of the diseased animals.

Whether through the information thus derived, or from other causes, the loss from this dreaded scourge has been conspicuously less during the last few years. Certain it is, men are on the alert to prevent, through intelligent endeavors, the infection of herds, even though they do not, in words, admit the truthfulness of the "germ theory."

The investigations of the author on "blight" of the pear tree and other plants—the only facts yet made public of injuries to living vegetation by bacteria,—have a scientific interest in consequence of the readiness with which studies may be made. It is not possible to cut pieces from the flesh of live animals and examine them under the microscope in their living state; but this can be done with plants. In the latter there are no sympathetic inflammatory processes, by which a healthy part suffers in consequence of injury to some other part of the body; neither are there facilities for the distribution of microscopic parasites through the structure, as there is in the blood currents of animals. We often say the sap "circulates;" but no such thing really takes place. All the movements of fluids in plants are processes of imbibition, or soaking through the cell-walls, never in streams in tubular vessels. Hence disease infection is local, and the effects are comparatively very easy to make out.

In animals it is hard to determine whether the injury comes from the destructive action of bacteria or from their mechanical obstructions, or the poisons they give rise to, etc.; in the pear tree such queries are quickly answered, and one soon sees that death comes from the fermentation of the cell contents. It is highly probable that much can in this way be learned to help in the study of similar maladies of man and the domestic animals.

The studies on blight have also a practical interest in the well proved fact that the progress of the disease is slow, instead of the rapidly spreading plague formerly thought. Careful examination, once or twice a month, will usually suffice for the efficient excision of all infected parts, and this, if properly done, is perfect protection to the tree. The wounds must be quickly covered with paint or other dressing.

The attested fact that the poisonous principle of certain plants, as of poison ivy or oak (Rhus), is a living organism (T. J. Burrill, Proceedings American Association for the Advancement of Science, 1882,) instead of a volatile chemical compound as heretofore supposed, is also a fruitful beginning in the study of the *origin* of infectious diseases. Of a similar nature is the ascertained fact that a micro-organism found in the saliva of healthy human beings,

causes death when inoculated into a healthy rabbit, (Sternberg, National Board of Health, 1880).

Such facts offer no contradiction to the disease-producing agency of the observed living organisms; but only show that they may be harmless to one host and deadly to another, at least when first introduced. Many facts go to show that the physiological system may become inured to those poisons as well as to those of a chemical nature. As a man becomes habituated to the use of deadly doses of opium and arsenic, so in like manner he may resist after a time the pernicious effects of bacteria, though the latter continue to live and multiply in certain parts of his body. This probably explains the peculiar characteristics and effects of "Texas cattle fever." In this very characteristic disease of neat cattle the native animals of Texas do not suffer, while those recently introduced from abroad are almost certainly affected. Still more curiously, the healthiest Texan animals carry the contagion with them when transferred to the Northern States. where for a time the alarming death of cattle which have in anyway come in contact with those from the South excites the liveliest inquiry and most earnest investigation as to the cause. Until bacteria became known as true disease producers no satisfactory explanation could be made of the strange phenomenon.

What inscrutable mystery has been connected with that terrible scourge to human beings, leprosy! How it baffled the skill of the physician, and doomed the unfortunate to helpless and hopeless misery, making them loathsome though pitiable objects; life a wearisome burden to themselves, and their very being a menace to their friends! But the puzzle is solved. Through the microscope, the cause is visible as a self-perpetuating, parasitic plant, growing, propagating, destroying; yet subject to the same general surrounding conditions as other life-possessing things. Its terror is half gone from being known, and scientific medical treatment will banish the other half. Though by no means a disease of the ancient times alone, its uninterrupted career need no longer darken the lives of innocent sufferers superstitiously supposed to be under the curse of God's anger. The diseased need no longer be driven to the deserts or isolated in asylums for life in order to protect the community from the dreadful plague.

Without attempting to give a *résume* of what is known of the disease-producing effects of bacteria, but simply illustrations of this knowledge, mention is here made of only one more case,—the most dreaded and destructive of all the ills of the human body, consumption, (tuberculosis). Since 1865 this has been positively known to be transmissible from the diseased to the healthy, though not formerly so recognized. Up to the present year able investigators have sought in vain for the parasitic organism which all analogical facts strongly indicated must be the cause of the terrible disease. But skill and patient research have at last triumphed. By certain processes of staining, the first of which rewarded the labors of Dr. R. Koch of Berlin, the destroyer has been detected, and has now been seen by hundreds of expectant eyes. It inhabits diseased parts of the body, which may be in almost any organ as well as the lungs; it lives and grows and reproduces, slowly for its kind, but surely working its dreadful results. The disease is common to

human beings and the domesticated animals, and is transmissible from one to another in either order. With such knowledge and the possibility, now of definite and sure grounded study, the misery and suffering heretofore so calamitously common, must soon be beneficently controlled, and the world made brighter and happier to unnumbered thousands of its inhabitants. We cannot anticipate the results in regard to cure, but may comprehend means of prevention. There need be no more discussion about hereditary taint except as in direct conditions. Let it be well understood that the terrible disease is liable to be contracted from an animal or man suffering from it by any one predisposed to its attack, and let the modes of infection be made known, and instead of one-seventh of the human family perishing, as they now do after months and years of misery, the statistican, of the future may write one-seventy-seventh. Whatever alleviation there may be for those already diseased, the above is not too much to reasonably expect as to prevention.

3. Benefits.

The foregoing might lead one to the conclusion that bacteria were injurious and only injurious in their effects, but a little thought will soon convince us that this is far from the truth. They are primarily the agents of decay, yet in this very sense untold good comes from their activities. It is indeed no more startling than true to say that as at present constituted the organic world is indebted to them for its existence; without them man could not live upon the earth. The processes of nature run in a circle, the possibility and perfection of which depend upon the proper filling of every part. Green plants, the architects of the world, build solid structures out of gaseous and liquid materials, but must have these materials furnished. They create nothing. The supply being limited, this would soon be exhausted were there not some provision to prevent it. We have seen that organic materials, though dead, have no inherent tendency to decompose; kept free from the working of living things they endure forever, except when consumed by fire. How different the world would be without putrefaction and decomposition! Eliminate these processes now, and we should see the fallen trunks of trees accumulating in the forests as obstructions, instead of helping to form a rich vegetable mould for future growths and generations of forests; the mummied bodies of animals would remain for all time, like the grotesque cadavers of the old Egyptians, teaching history, but teaching only the sad one of the reign of death. It is well known that fertile soils have as an indispensable part of their composition a certain amount of partially decomposed vegetable matter; this is in truth the special characteristic of the surface soil as distinguished from the subsoil. Our field and garden plants are dependent on this rich upper stratum, and our valuable animals and ourselves are dependent on the plants; hence, following the circle round, we reach the knowledge of our indebtedness to the bacteria as agents of decomposition.

There is another way in which the fertility of soil has recently been shown to depend on bacteria. Green leaved plants require nitrogen as an essential part of their food, and they are only able

to make use of this when in the shape of nitrates, or as combined with earthy or mineral substances. It has long been known that saltpeter (nitrate of potash) collects in caves. In times of need, it has been artificially obtained by washing earth in which there existed considerable amounts of organic matter undergoing decomposition, and to the surprise of the workmen such soil, after certain intervals of time, may be washed and re-washed without apparent exhaustion. So it came to be understood in time that in suitable caves the compound actually formed where it was found, not simply collected there through the percolation of water, etc. Upon heating a portion of such nitro-collecting earth, or treating it with chloroform, this peculiar power was observed to be lost, and by further investigation it was demonstrated that a microscopic living organism is the real agent in the work. Thinking no doubt in part of this, a well-known scientist has announced as the topic of a paper, "The soil a factory, not a mine."

We more directly make use of bacteria in many ways. The fermentations in which alcohol is the chief product, are commonly due to the yeast plants, closely allied to the bacteria; but the latter are rarely absent from brewers' yeast, used in bread-making. The so-called "salt-rising" is wholly dependent on the work of bacteria. Similar agents make for us vinegar and saur kraut; for the chemist, litmus; they "rot" flax; they "bleach" linen and cotton spread out on the dewy grass; they clean bones macerated in water by the anatomist; they purify the waters of rivers, cisterns and tanks, causing it in close reservoirs to "work," after which it is sweet and bright. It is said bacteria play an important part in the manufacture of cheese, and in the production of certain perfumes and flavoring extracts. They are found in germinating seeds and in the digestive organs of animals; but whether or not of real use in these cases, cannot be confidently stated. It is even probable that the wonder-working little creatures are used in medicine under cover of some other name and idea, the physician as well as the patient being ignorant of the real action of the dose. It is pretty certain that epidemics among noxious insects sometimes occur through the influence of bacteria. Considerable interest was recently taken in the apparent destruction, under certain conditions, of insects by yeast artificially applied to their bodies or given them to eat. But the results of experiments seemed to show that the yeast itself was not capable of injuriously affecting any insects, and it was left to conjecture whether or not there might be something else in some specimens of yeast cake or powder which, by its action, would explain the few known instances of the death of insects presumably from the effects the yeast tried. It has now been demonstrated by Prof. S. A. Forbes (*American Naturalist*, Oct., 1882,) that living chinch bugs are sometimes filled with enormous numbers of bacteria, and the observations so far made go to show that such bugs are decidedly unhealthy, and perish in great numbers before completing their full development. Certain it is that these pests of the grain fields do die off at times by some epidemic among them, as the writer can testify from his own observations. Hundreds of them, of all ages, have been found about harvest-time in little heaps, at the base of wheat plants, dead and dying, while the

weather and other conditions were favorable for their life and development. The disastrous scourge to "silk-worms," before mentioned, shows that such diseases of insects are not only possible, but they really do exist. Pasteur suggests investigations to find out some such destroyer of the *Phylloxera* now so injurious to the grape vines in Southern Europe, and he is quite confident that success would crown proper efforts in this direction. There does seem to be in this a line of study of most excellent promise, not for one species of injurious insects only, but for the mastery by man over many of his minute but most dreaded enemies.

PART III. CLASSIFICATION OF BACTERIA,

AND A SYSTEMATIC DESCRIPTION OF THE SPECIES.

No one pretends to have made out a complete, natural classification of the *Schizophytæ* or bacteria; although several naturalists have embodied in systematic form, their ideas of the kinds and their relations, based on shape, development, motion, physiological effects, etc.; but all such classifications are acknowledged to be preliminary and more or less artificial. That, however, which proves to be most useful and apparently as nearly natural as any, is founded on the form of the cells and their organic association. It has been best worked out by Dr. Ferdinand Cohn, substantially as follows:

TRIBE I. SPHÆROBACTERIA.

Cells globular, or oval; size, very small, often less in diameter than .00004 in.; isolated, in pairs, or in chains of many articles, or when young and actively increasing in number, imbedded in gelatinous masses, called *zoogloœa*, or when forming a pellicle on the surface of liquids, *mycoderma;* without true spontaneous motion, but oscillating in liquids by molecular trepidation.

But one genus, viz.: *Micrococcus.*

TRIBE II. MICROBACTERIA.

Cells elongated-oval or short-cylindrical; isolated, in pairs, or in chains of four, more rarely of many rather loosely attached, or sometimes in zoogloœa; with active, spontaneous motions, when in nutritious liquids supplied with free oxygen.

One genus, viz.: *Bacterium.*

TRIBE III. DESMOBACTERIA.

Cells cylindrical, usually several times as long as wide, straight; isolated, or usually united in chains; often with spontaneous movements, but in the case of some species always without motion.

Genera: *Bacillus,* and with some doubt, *Leptothrix, Beggiatoa, Crenothrix.* The question about these three genera is whether they should be included among the *Schizophytæ* or referred to the filamentous *Algœ.*

TRIBE IV. SPIROBACTERIA.

Cells cylindrical, usually several times as long as wide; curved, or spirally wound; isolated, or united in chains of less or greater length; with active, spontaneous movements.

Genera: *Vibrio, Spirillum, Spirochæta.*

Besides the above, other species, multiplying by self-division, are referred to the following genera: *Sarcina, Ascococcus, Streptococcus, Myconostoc, Cladothrix* and *Streptothrix.* The old genus *Monas*, formerly including many species of low animals and plants, has been so modified that it now contains only a few forms of doubtful affinities.

It must be remembered that these genera are principally based on the shape and association of the cells, and that the latter are supposed to be in their adult condition. It may be that very arbitrary separations are made. It is quite possible, indeed, that the same specific organism assumes, under certain conditions, several of the proposed generic forms; but, it is at least probable that each genus named includes some species which do not change beyond the limits of the description. For instance, the spores of *Bacillus* would, from appearances alone, be classed as *Micrococcus* at first, and as *Bacterium* after a certain period of growth; but *Bacterium termo* never changes so much that the genus can be mistaken. Billroth goes so far as to claim that all the subjects of Cohn's classification, except, perhaps, those constituting the genera *Spirillum*, and *Spirochæta*, belong to a single species, which he names *Coccobacteria septica*, while Nägeli supposes there exists a small number of true species, each of which takes several forms.

With such differences of opinion among those most competent to judge, we cannot pronounce with any confidence upon the number or the actual characteristics of the species in existence; but that true species do exist we may feel well assured. When sufficient knowledge has been gained of their life histories, a natural classification can be arranged. In the meantime, such as we have already outlined must continue to be of much service, as it has been in the past.

Dr. Luerssen has arranged the following key to the genera:

I. Cells not in [cylindrical] filaments, separating immediately after division, or in couples [or chaplets] free or united in colonies (Zoogloœa) by a gelatinous substance.

A. Cells dividing in one direction only.

a. Cells globular.....*Micrococcus.*
b. Cells elliptical or shortly cylindrical.....*Bacterium.*

B. Cells dividing regularly in three directions, thus forming cubical families, having the form of little bags attached side by side, and consisting of 4, 8, 16, or more cells.....*Sarcina.*

II. Cells united into cylindrical filaments.

A. Filaments straight imperfectly segmented.

a. Filaments very fine and short, forming rods.....*Bacillus.*
b. Filaments very fine and very long.....*Leptothrix.*
c. Filaments thick and long.....*Beggiatoa.*

B. Filaments wavy or spiral.

a. Filaments short and stiff.
a. Filaments slightly wavy, often forming wooly flocks.....*Vibrio.*
b. Filaments spiral, stiff, moving only forward and backward.....*Spirillum.*
b. Filaments long, flexible, with rapid undulations, spiral through their whole length, and endowed with great mobility.....*Spirochæta.*

What follows is chiefly from Dr. Rabenhorst's *Kryptogamic Flora of Germany, Austria and Switzerland,* of which this part has been recently (1881) re-edited by Dr. G. Winter, of the University of Zürich, and which is translated from the German by the present writer. The original source of the most of the matter is Cohn's *Beitrage zur Biologie der Pflanzen.* As the work now stands the systematic description of species, herein given, is believed to be the fullest and most nearly complete of any in existence. In the English language the only similar publication is Dr. Sternberg's translation of Magnin's treatise.

Winter unhesitatingly classes the bacteria among the Fungi and includes in the latter all cellular Cryptogams (flowerless plants) devoid of chlorophyll. It is true that this rigid classification unnaturally separates some species certainly very closely allied; but, since the physiological effects are of prime importance in the practical study of these plants, this separation is less to be regretted. It must certainly serve a useful purpose to present together those which, through the want of chlorophyll, are dependent on the assimilated products of other plants and animals for nutriment, and which thus agree in being agents of destruction in organic matter.

I have added to those in Winter's work such further species as seem to be well established, as well as some doubtful but often quoted names—the latter mostly by Hallier, and are copied from Magnin. The following are herein described as new species:

Micrococcus amylovorus, the "blight" of pear trees, etc.

Micrococcus toxicatus, the "poison" in species of *Rhus* (Poison Ivy, etc.)

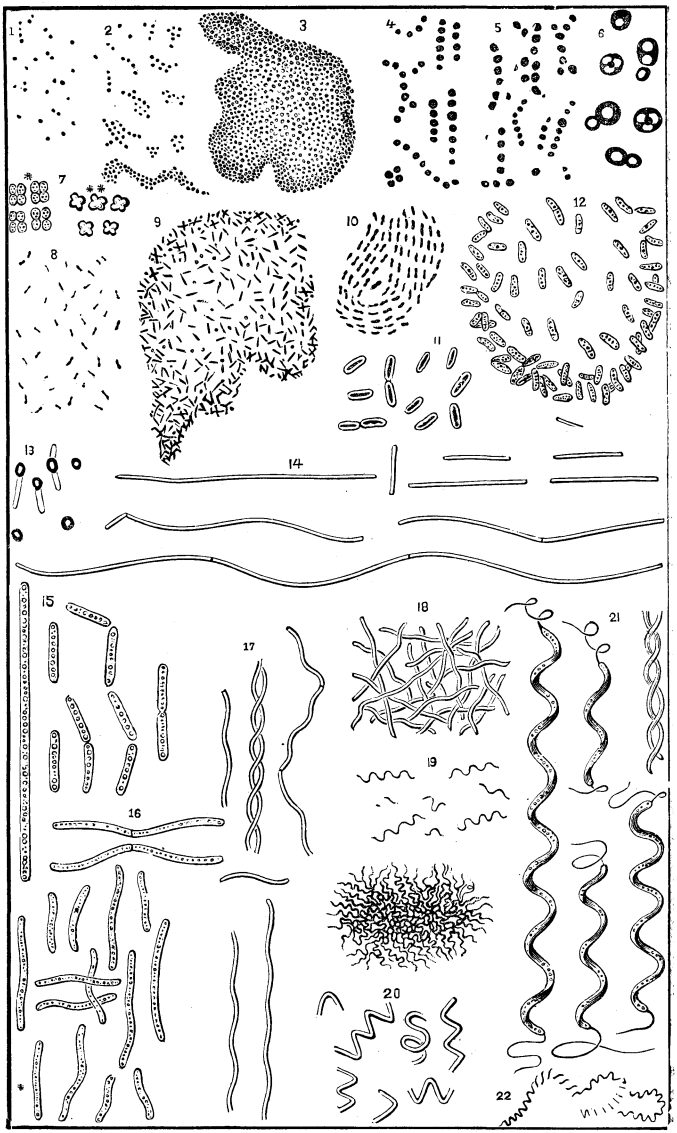
Micrococcus insectorum, in diseased chinch bugs and supposed to be the cause of an epidemic destruction of these insects.

I have also felt obliged to name anew the organism found by Dr. Detmers and others in diseased pigs, for though there is a general agreement that the species belongs to *Micrococcus,* no one has published a name for it thus classified. It may now be known as *Micrococcus suis.* For the organisms causing the disease of the common fowl usually known as "chicken cholera" I have proposed the name of *Micrococcus gallicidus.* Several species have been recorded without specific names, because properly published names for them are not known by me. Thus, while some write *Bacillus tuberculosis* for the recently discovered species in this disease, I am not informed that the name as such has been published by Koch or any one else according to established usage. Still this may be the case and a new name should not be given. I have therefore simply written *Bacillus of tuberculosis.*

All notes and additions by myself to the German text are inclosed in brackets. In the translation I have endeavored to express the evidently intended meaning of the author rather than to make a literal rendering of the wording.

PLATE I.

FROM "MICROSCOPICAL JOURNAL."



DESCRIPTION OF PLATE I.

[Fig. 1.—Micrococcus prodigiosus (Monas prodigiosa, Ehr.) Spherical bacteria of the red pigment, aggregated in pairs and in fours, the other pigment bacteria are not distinguishable with the microscope from this one.

Fig. 2.—Micrococcus vaccinæ. Spherical bacteria, from pock-lymph in a state of growth aggregated in short four to eight-jointed straight or bent chains, and forming also irregular cell-masses.

Fig. 3.—Zoöglœa-form of Micrococcus, pellicles or mucous strata characterized by granule-like closely set spherules.

Fig. 4.—Rosary chain (Torula form) of Micrococcus ureæ, from the urine.

Fig. 5.—Rosary chain and yeast-like cell-masses from the white deposit of a solution of sugar of milk which had become sour.

Fig. 6.—Sacharomyces glutinis (Cryptococcus glutinis, Fersen), a pullulating yeast which forms beautiful rose-colored patches on cooked potatoes.

Fig. 7.—Sarcina spec, * from the blood of a healthy man, * * from the surface of a hen's egg grown over with Micrococcus luteus, forming yellow patches.

Fig. 8.—Bacterium termo, free motile form.

Fig. 9.—Zoöglœa-form of Bacterium termo.

Fig. 10.—Bacterium, pellicle, formed by rod-shaped bacteria arranged one against the other in a linear fashion, from the surface of sour beer.

Fig. 11—Bacterium lineola, free motile form.

Fig. 12.—Zoöglœa-form of B. lineola.

Fig. 13.—Motile filamentous Bacteria, with a spherical, or eliptical highly refringent "head," perhaps developed from gonidia.

Fig, 14.—Bacillus subtilis, short cylinders, and longer, very flexible motile filaments, some of which are in process of division.

Fig. 15.—Bacillus ulna, single segments and longer threads, some breaking up into segments.

Fig. 16.—Vibrio rugula, single or in process of division.

Fig. 17.—Vibrio serpens, longer or shorter threads, some dividing into bits, at * two threads entwined.

Fig. 18.—"Swarm" of V. serpens, the threads felted.

Fig. 19.—Spirillum tenue, single and felted into "swarms."

Fig. 20.—Spirillum undula.

Fig. 21.—Spirillum volutans, * two spirals twisted around one another.

Fig. 22.—Spirochæta plicatilis.

All the figures were drawn by Dr. Ferdinand Cohn with the immersion lens No. IX, of Hartnack Ocular III, representing a magnifying power of 650 diameters.]

KEY TO THE GENERA OF SCHIZOMYCETES.*

		PAGE.
1. Cells globular or oval	2	
— Cells short or long cylindrical	5	
— Cells lancet like, flat, spirally wound	*Spiromonas.*	149
2. Cells isolated or united in chains, or in formless masses imbedded in mucus	*Micrococcus.*	130
— Cells united in very great number in regular colonies	3	
3. Colonies hollow, with a single peripheral layer of cells	*Cohnia.*	137
— Colonies solid, filled with cells throughout	4	
4. Cells united in small but fixed number in regular families	*Sarcina.*	137
— Cells united in unlimited number in irregular colonies	*Ascococcus.*	136
5. Cells short cylindrical, single, in pairs, or a few more loosely joined	*Bacterium.*	139
— Cells longer cylindrical joined in filaments	6	
6. Filaments isolated or felted	7	
— Filaments imbedded in globular jelly-masses	*Myconostoc.*	148
7. Filaments not branched	8	
— Filaments with apparent branches	*Cladothrix.*	147
8. Filaments straight	9	
— Filaments spirally wound or curved	11	
9. Filaments distinctly articulated, short	*Bacillus.*	141
— Filaments mostly indistinctly articulated, long	10	
10. Filaments very slender	*Leptothrix.*	145
— Filaments thicker	*Beggiatoa.*	145
11. Filaments short with few spirals or a single curve, rigid	*Spirillum.*	150
— Filaments longer with numerous spirals, flexible	*Spirochæta.*	148

The Genera *Sphærotilus* and *Crenothrix* may be found in the appendix. 152

The *Sacharomycetes* have also been added. 154

SYNOPSIS OF THE GENERA.

Micrococcus.—Cells globular or oval-elliptical, motionless,† dividing only in one direction, isolated or united in chains or in zoogloœa.

Ascococcus.—Cells globular, united in irregular families, which are often lobed and surrounded by a capsule of firm, cartilage-like jelly.

Cohnia.—Cells globular, imbedded in a single peripheral layer of jelly, which is spherical and hollow, or at a later stage irregularly bladder-form; the forms like nets are broken through.

Sarcina.—Cells globular, dividing in two or three directions; daughter cells small, united in solid or tabular families, mostly in fours, or some multiple of four.

*[Dr. Winter adheres to the opinion that the Fungi and Algæ are distinct classes of plants, and includes the *bacteria* among the former. For this reason the term *Schizomycetes* is chosen rather than *Schizophytœ*.]

†[*i. e.*, having only "Brownian" movement—not swimming freely from place to place.]

Bacterium.—Cells short cylindrical, or long elliptical, or fusiform, with rapid movements; otherwise as in *Micrococcus.*

Bacillus.—Cells elongated cylindrical, mostly united in filaments dividing transversely; forming spores.

Leptothrix.—This doubtful genus is characterized by the very long, slender, unbranched and apparently unarticulated filaments.

Beggiatoa.—Filaments very long, rather thick, mostly indistinctly articulated, actively vibrating, containing highly refractive granules.

Cladothrix.—Filaments very slender, indistinctly articulated, pseudo-branched.

Myconostoc.—Filaments very slender, bent and twisted through each other, imbedded in globular, jelly-like masses.

Spirochæta.—Filaments long and very slender, with numerous close spirals; movements lively.

Spiromonas.—Cells flattened, spirally twisted.

Spirillum.—Cells cylindrical, with a single curve or spirally wound, mostly with a cilium at each end.

APPENDIX.

To the *Schizomycetes* are appended the following allied genera whose systematic position is still doubtful:

Sphærotilus.—Cells arranged end to end in a colorless, gelatinous sheath, forming long threads and flocks.

Crenothrix.—Cells united in filaments surrounded with a sheath.

SCHIZOMYCETES.

The *Schizomycetes* or cleft-fungi are one-celled plants, which multiply by repeated division in one, two or all three directions of planes, and which also abundantly reproduce themselves by spores formed within the cells.

They live isolated or united in various ways, in fluids and in living and dead organisms, in which they induce decompositions and various—but not alcoholic—fermentations.

MICROCOCCUS, Cohn.

(Beiträge z. Biol. d. Pflanzen, I Bd. 2 Heft, p. 151.)

Cells colorless or slightly tinted, globular or oval-elliptical, motionless, dividing only in one direction. The daughter cells either soon separate from each other or remain in pairs or are united in chains or form zooglœa. Not certainly known to produce spores. [The molecular oscillations of these minute bodies must not be mistaken for spontaneous movements.]

The species of *Micrococcus* are not readily discriminated. The supposed distinct kinds show in form and size little or no differences and there remains only their chemical activities as the means of distinguishing them, which may be managed with considerable completeness.

A.—Pigment forming Micrococci.

M. Prodigiosus, Cohn.

Synonyms: *Monas prodigiosus,* Ehrb. (Monatsbr. der. K. Akad. d. Wissensch z Berlin 1848.) *Palmella prodigiosa,* Mont. (Bulletin de la Soc. Nat. et cent d' Agricult. deParis, 2 Sèr. VII, p. 727); *Zoogalactina imetropha,* Sette (Mèm. venezia 1824.) *Bacteridium prodigiosum,* Schroeter (Beitr. z. Biol. I, 2 Heft, p. 110.)

Exsiccata: Rabenhorst, Algæ, 2990; Thümen, Mycotheca Universalis, 1500.

Cells globular or oval, colorless, .00002 to .00004 in. in diameter; at first rose-red, then blood-red, finally growing pale; forming a slimy substance.

Micrococcus prodigiosus is the organism which, as known for some time, produces the singular phenomenon called in earlier times the blood of bread, the blood of the Host, etc. It forms at first minute rose-red points, and little heaps, which, becoming larger, form circumscribed, roundish, deep-red spots; afterward these spots run together and spread out, at the same time become dripping with a blood-red semi-fluid material. This consists of a red, gelatinous mass in which millions of cells of the Micrococcus are imbedded. The latter are colorless; they give out the pigment to the jelly. The coloring matter, in its chemical and physical characteristics, very much resembles fuchsin. It is insoluble in water, but completely soluble in alcohol, and this solution evaporated to dryness and again dissolved is orange-red. On the addition of acids it becomes bright-red; with alkalies yellow. In the spectroscope it shows with others a characteristic broad absorption band in the green. *Palmella mirifica*, Rabh., can scarcely be different.

M. luteus, Cohn.

Synonym: *Bacteridium luteum*, Schrœter (l. c. p. 119 und 126).

Exsiccata: Thümen, Mycotheca Universalis, 1400.

Cells elliptical, a little larger than those of *M. prodigiosus*, with highly refractive contents; forming light-yellow drops on a solid substratum, at first the size of a poppy seed, later the half of a grain of pepper, and finally drying up into flat, shield-form, little bodies. This species forms, on the nourishing fluid, a thick yellow skin which becomes wrinkled if the development is luxuriant.

On boiled potatoes, etc.

The coloring matter is insoluble in water; it is not changed by sulphuric acid or alka lies

M. aurianticus, Cohn.

Synonym: *Bacteridium aurantiacum*, Schrœter (l. c. p. 119 und 126.)

Exsiccata: Thümen, Mycotheca Universalis, 1700.

Cells oval, .00006 in. long; forming, on a solid substratum, orange-yellow drops and spots, which finally spread into a uniform coating; on nutritive fluid it forms a golden-yellow layer.

On boiled potatoes and eggs.

Coloring matte · soluble in water.

M. ulvus, Cohn,

Exsiccata: Rabenhorst, Algæ Europeæ, 2501.

Cells globular, .00006 in. in diameter; at first forming rust-red conical little drops .02 in. in diameter, these enlarge and finally appear as a broad mass of slime.

On horse-dung.

M. chlorinus, Cohn.

Cells globular (?); forming golden or verdigris-green slime masses, or a verdigris-green layer on fluids which gradually becomes colored throughout.

On boiled eggs.

The coloring matter is soluble in water; it does not turn red with acids.

M. cyaneus, Cohn.

Synonym: *Bacteridium cyaneum*, Schroeter, (l. c. 122, und, 126).

Cells elliptical, producing on slices of potato an intense blue coloration which also penetrates the substance and even shows on the opposite side of the slice. On nutritive fluids zooglœa are formed which are at first colorless, then bluish-green and finally an intense blue.

On boiled potatoes.

The coloring matter is soluble in water; the solution is at first verdigris-green, afterwards as a rule pure blue. It is made by acids an intense carmine-red and changed again by alkalies to blue or gall-green. In the spectroscope it shows no absorption-line but only a darkening of the less refractive parts.

M. violaceus, Cohn.

Synonym: *Bacteridium violaceum*, Schroeter (l. c. p. 157).

Cells elliptical, larger than those of *M. prodigiosus*, in little bright violet-blue drops of slime which enlarge (to one-fourth of an inch in diameter) and run together into spots.

On boiled potatoes.

B.—Micrococci producing fermentations.

M. ureæ, Cohn.

Cells globular or oval, .00005 to .00008 in. in diameter, isolated or united in chains, or forming zooglœa on the surface of liquids.

In urine.

Micrococus ureæ is the ammoniacal ferment. When fresh urine is allowed to stand at a proper temperature (30° C.), it loses in a few days its acid reaction, becomes neutral and finally alkaline, showing signs of fermentation. The urea is changed into ammonium carbonate, while at the same time ammonio-magnesium phosphate is precipitated. This fermentation follows only when the Micrococcus is developed in the liquid.

M. crepusculum, Cohn.

Synonym: *Monus crepusculum*, Ehrb. (Infus, p, 6, t. I, Fig. 1).
Exsiccata: Rabenhorst, Algen Europa's, 2502.

Cells globular or short-oval, very small, scarcely .00008 in. in diameter, isolated or forming zooglœa.

In and on various infusions and foul liquids.

This common Micrococcus appears with *Bacterium termo* in all foul substances and infusions.

M. candidus, Cohn.

Forms on slices of boiled potato snow-white points and spots.

[M. of nitrates.

Schloesing and Muntz have communicated to the French Academy of Science the results of studies on the formation of nitrates in ordinary soil, and they prove that a minute, globular, or slightly elongated organism, is the cause of the phenomenon so common in nature, and of such vital importance in the fertility of the soil. (*Comp. Rendus*, T. 89, pp. 891 and 1104). More recently, Gayon and Dupetit have shown that these same nitrates are decomposed by another *Micrococcus*, possibly *M. ureæ*. (l. c. T. 95, p. 644).]

C.—Disease producing Micrococci.

M. Vaccinæ, Cohn.

Synonym: *Microsphæra vaccinæ*, Cohn (Virchow's Archiv. LV.)

Cells globular .00002 to .00003 in. in diameter, isolated or in pairs or united in chains or masses, or forming zooglœa.

In fresh lymph of vaccine vesicles of the cow, and of man, as well as in the pock-postules of variola (small pox.)

Micrococcus vaccinæ must be accepted, after the many reliable investigations, as the effective element in vaccine virus. It is the carrier of the contagion of small pox. By filtering the lymph the solid constituent can be separated from the fluid. When the latter is used for inoculation no effect is produced, while the former induces the formation of the pock-vesicles. But that the micrococci and not the lymph cells are the active constituent of the solid residue appears from the fact that when vaccine virus is exposed to the air for a time it becomes less and less effective. Such virus finally putrefies, and with the increase of putrefaction the micrococci correspondingly disappear, displaced by rot-producing *Bacteria*.

M. diphtheriticus, Cohn.

Cells oval .000013 to .000004 in. long, single or united in chains or forming variously-shaped masses and colonies.

In the so-called diphtheritic membrane found especially on the mucus surfaces of the throat, pharynx, windpipe, etc., but also of those of the sexual and digestive organs, as well as in wounds, etc.

This organism is of very great pathological importance: for the infection spreads from its place of origin through the lymph vessels and their enclosing tissue, later into the connective tissue, the kidneys, the muscles, and finally the organisms gain entrance to the blood vessels, where they cause the greatest disturbances. They plug the capillaries and cause them to burst. The thinner bones and cartilage are destroyed through this same process. The contagious properties of the fungus is also very great.

M. septicus, Cohn.

Synonym: *Microsporon septicum*, Klebs. (zur. patholog. Anat. der Schusswunden, 1872.)

Cells globular .00002 in. in diameter, united in chains or masses or forming zoogloœa.

In wounds; generally with all the kinds of disease known as *Pyœmia* and *Septicœmia*.

In the various states of suppurating and putrefying in the living body, in blood-fermentation and blood-poison, this micrococcus plays an active part. Whether all the manifold phenomena are called forth by micrococcus septicus or more kinds take part, is questionable. In wounds we find the micrococci in the fresh pus, in which they multiply rapidly and bring on inflammation and fever, destroying the tissues and penetrating deeper and deeper. They gain entrance to the blood vessels and cause obstructions and festering; similar phenomena occur in the lungs and liver.

[**M. bombycis,** Cohn.

Synonym: *Microzyma bombycis*, Bechamp (Comptes Rendus, tome 64, 1867, p. 1045.) Exsiscata, Umlant w.; Thümen Mycotheca Universalis 1799.

Cells oval .00002 in. in diameter, single or in chains.

In the gastric juice and intestines of silk-worms, producing in them the so-called "Schlaffsucht" [pébrine], an infectious disease from which the animal after a short time dies.

There are probably many other infectious diseases, as cholera, measles, scarlatina, typhus fever, etc., which are due to *Bacteria*. Reliable observations are wanting upon them.

[M. of traumatic erysipelas.

This disease has been abundantly proved to be contagious and in many cases very virulently so. There have also been very numerous observations upon the existence of globular organisms in the excretions, but it has not been known until recently whether these living things were active agents in, or merely accompaniments of, the disease. The investigations of Orth, Recklinghausen and Lukomsky, corroborated by Koch and others, seem to demonstrate the fact that a *Micrococcus* is the real cause of the occurring pathological changes and the active element in the contagion. Puerpural fever is probably due to the same organism.

This *Micrococcus* is described as globular, isolated or in chains, without motion.]

M. of croupous pneumonia.

Many investigators agree in finding minute organisms in the excretions of inflamed tissues affected with this disease. Friedländer of Berlin has recently (1882) made careful researches, which seem to establish the fact that the living organisms exist and multiply within the tissues and blood vessels and not simply in the exudations. The description is as follows: Cells ellipsoidal, .000024 in. wide, .00004 in. long, usually in pairs, sometimes in chains or spread out in a film, aggregated in colonies in the lymphatic vessels. Lancet (London) March 4, 1882.]

[**M. amylovorus,** Burrill.

Cells oval, single or united in pairs, rarely in fours, never in elongated chains, imbedded in an abundant mucilage which is very soluble in water; movements oscillatory; length of a separate cell .00004 to .000056, in.; width, .000028 in.; length of a pair .00008 in.; of four united about .000012 in.

The cause of "blight" in plants, especially of the pear tree (fire blight) and of the apple tree (twig blight and sun scald.) The organism gains entrance to the living tissues through wounds or punctures and produces butyric fermentation of the starch stored in the cells. The disease is transmissible by artificial inoculation. (Tenth Report Illinois Industrial University. Transactions American Association for the Advancement of Science, 1880.)]

[**M. suis,** (Detmers) Burrill.

Cells globular, or elongated and more or less contracted in the middle, single or in pairs or chains of many articles; .000028 to .000032 in. in diameter (Detmers).

Found in the blood and other fluids of pigs suffering with swine plague or "hog cholera." Dr. Detmers at first classed this organism with the *Bacilli* and named it *Bacillus suis*. But Detmers, Mèguin and Salmon essentially agree in giving the characteristics of *Micrococcus*, and with this some observations of the author accord. Detmers describes a peculiar contraction of the middle portion of elongated forms rendering the sides concave, and in this condition he finds them in zoogloea and in chains. Others, according to the same authority, as well as Méguin and Salmon, are spherical. It seems well established that the *Micrococcus* is the real contagious element in the disease. (Annual Reports United States Department Agriculture 1870-80.)]

[**M. toxicatus,** Burrill.

Cells globular, single and in pairs, rarely in chains of several articles; .00002 in. in diameter; movement oscillatory only.

Apparently parasitic on species of *Rhus*, and constituting the poisonous principle in these plants. Reaching the human skin, the organisms penetrate in some way its tissues, and multiplying there induce the peculiar inflammation which takes place. (Some Vegetable Poisons, Trans. American Association for Advancing Science, 1882. Am. Mic. Journal, October 1882, p. 192.)]

[**M. insectorum,** Burrill.

Cell obtusely oval, isolated or in pairs, rarely in chains of several articles; .000022 in. wide and .000027 to .00004 in. long, usually about .000032 long; movements oscillatory only; forming zoogloea (?). In the digestive organs of chinch bugs (*Blissus lencopterus*).

Professor S. A. Forbes discovered this minute organism, in 1882, infesting the intestines of chinch-bugs, which evidently suffered thereby (S. A. Forbes, American Naturalist, Oct. 1882.) Very many of the insects, especially the older ones, were found to harbor the parasite in great numbers, and at certain times very many of the bugs were found dead and dying before reaching maturity. It is well known that these pests of the grain fields do perish at certain periods by some epidemic disease, from which few individuals escape, and there is every reason to believe that the organism found by Professor Forbes causes the destruction. He finds it can be successfully cultivated in beef-broth, and the possibility is thus apparently within reach of artificially introducing and spreading the disease. If so, a most important step has been made in economical entomology and scientific agriculture.

The organism is somewhat similar to, but not identical with, *Micrococcus bombycis*[1] the "disease germ" of the silk worm, which was so fatally destructive to the silk industries of France, and which became the subject of the successful studies of Pasteur.

On the stems and leaf-sheaths of maize injured by the bugs a *Micrococcus*, supposed to be the same, was found imbedded in firm zoogloœa masses.

The form of the organism approaches the typical shape of *Bacterium*, being between oval and short cylindrical, with rounded ends; otherwise the characteristics are those of a true *Micrococcus*.]

M. of fowl cholera.

While all who have carefully studied this disease agree that the contagious element consists of minute globular granules, capable of self-multiplication, it appears that no one has either named the organism or given a scientific description of it. Toussaint (Compt. Rend. xci (1880) p. 301) supposed he had sufficient proof of the identity of this disease of the domestic fowl and septicæmia, or blood-poisoning, and that in both cases the living organism believed to be the active agent, is the same. But Pasteur (l. c. p. 457) pronounces them similar in appearance but quite distinct in effect. Salmon (Report Dpt. Agriculture (U. S.) 1880, p. 401) confirms the infectious nature of the disease, and the virulence of the multiplying granules, but is inclined to attribute their origin to the transformations of the animal protoplasm (p. 439.) There can scarcely be a doubt but that the so-called granules constitute a true species of the present genus. It may be called *Micrococcus gallicidus*.]

DOUBTFUL SPECIES.

M. griseus, Winter.

Synonym: *Bacterium griseum*, Warming.

Cells nearly globular or oval, colorless; .00010, to 00016 in. long, with those dividing .00024 to .00028 in. long, .000072 to .00010 inches wide.

In infusions of fresh and salt water.

Since according to Warming this form appears only in the motionless state, (and then forms no zoogloœa) and since the shape of its cells corresponds better to the genus *Micrococcus* than to *Bacterium*, I have placed the fungus in the former genus.

M. ovatus, Winter.

Synonyms: *Panhistophyton ovatum*, Lebert. (Ueber die gegenwartig herrschende Krankheit des Insect der Seide in; Jahresbericht ueber die Wirksamkeit des Vereins zur Beförderung des Seidenbaues für die Provinz Brandenburg im Jahre 1856-57, p. 28 und folgde.)

Nosema bombycis, Naegeli. (Botan. Zeitg. 1857, p. 760; Flora 1857, p. 684.

Cells oval, twice as long as wide, rounded at the ends; .00016 to .0002 in. seldom 00024 in. long, .00008 to .00012 in. (mostly .00010 in.) thick, isolated in pairs or united in little masses.

In various organs of the silk-worms, their pupæ, and winged forms.

It is questionable whether the described cells belong to the *Schizomycetes*. They were first discovered by Cornalia in Mailand and designated corpuscles; according to him they are also found, though very scarce and more incidentally, in the blood of healthy caterpillars. Later these small bodies have been recognized as the cause of the epidemic disease of the silk-worm known as "gattine."

As the cells in shape and want of motion agree very well with *Micrococcus*, I have introduced them here.

[The eight following, by Hallier, are given without much confidence in the correctness of his observations and interpretations. These are taken from Magnin's "*Bacteria*."]

M. of animal variola, Hallier.

Small, endowed with lively movement, furnished with a very delicate appendage, sometimes united in the form of little elongated rods; found in spontaneous or inoculated pustules, in the lymphatic canals and the ganglia of animals attacked with variola.

M. of rugeola, Hallier.

Very small, without color, often with a caudal prolongment; in the sputa and blood of the sick.

M. of scarlatina, Hallier.

Free or in colonies, either on the surface or in the interior of blood corpuscles, or in chains.

M. of epidemic diarrhœa, Hallier.

In intestinal matters with vibrios, cells and monads.

M. of exanthematous typhus, Hallier.

Relatively large brown, endowed with rapid movement, sometimes in chains, in the blood.

M. of intestinal typhus, Hallier.

Very small, without movement in the blood; larger forms with quick movements, furnished with contractile appendages; in dejections. Similar Micrococci are found in cholera diarrhœa, but in less number.

M. of glanders, Zürn.

Cells free or adhering to the blood corpuscles, or even penetrating in their interior; sometimes in chains; in the blood. Very numerous, endowed with rapid movement; in the lymphatic ganglia, in the mucus of the frontal sinus and in chancroid ulcers.

M. of syphilis, Hallier.

Numerous, colorless, free or in globules; in gonorrhœa, the primitive ulcer, and in the blood of subjects with constitutional syphilis.

ASCOCOCCUS, Cohn.

(Beitr. z. Biol. I, Bd. 3, Heft, p. 154.)

Cells colorless, very small, globular, united in larger or smaller globular or irregular families in shapeless masses. Families often lobed, the lobes again incised, inclosed in a firm cartilage-like gelatinous capsule of rounded form.

The value of Cohn's genus *Ascococcus* is to me as questionable as that of Billroth's genus of that name; it is also doubtful whether the two are identical. Possibly *Ascococcus* is only a stage of development of *Micrococcus*.

A. Billrothii, Cohn.

Families lump-like, .00080 to .00640 in. in diameter, inclosed in a capsule from .00004 to .00060 in. thick; covering the surface of the liquid in a thick, flaky layer.

On a solution of acid ammonium tartrate, forming a pellicle.

The colonies consist of a sharply defined cartilage-like gelatinous envelope, in which either one or more families are inclosed. The families are of very different size and shape, solid, composed of numerous, exceedingly minute, globular cells. This fungus induces in its nourishing fluid singular fermentations. It produces of ammonium tartrate, butyric acid and butyric ether, and changes the originally acid solution to alkaline while free ammonia is given off.

COHNIA, WINTER.

Synonym: *Clathrocystis* (Henfry), Cohn (Rabenhorst's Algen Europas, No. 2318.

Cells globular; inclosed in a single, peripheral layer of jelly, forming a spherical, or later an irregularly shaped bladder or sack, the walls of which finally break up in a net-form manner. Increase takes place by repeated separation of the cells in twos; of the families through the folding in and lobing of the daughter families.

The genus *Clathrocystis*, Cohn, is removed according to my idea of the distinction between the *Algæ* and *Fungi*. Since this generic name was primarily adopted for an alga (*Cl. aeruginosa*, Henfry) it is advisable to retain the name for it and to make this species belonging to the *Fungi* the representative of a new genus, to which I have given the name *Cohnia*, in honor of Dr. F. Cohn, of Breslaw, highly merited for his investigations upon the *Schizomycetes*.

C. roseo-persicina, Winter.

Synonyms: *Protococcus roseo-persicina*, Kütz. (spec. Alg. p. 196); *Pleurococcus roseo-persicina*, Rabh. (Flora Europ. Alg. III, p. 28); *Microhaloa rosea*, Kütz. (Linnæa VIII, p. 341); *Bacterium rubescens*, Lankaster. (Quart. Jour. Mic. Lc. XIII, New Series, p. 408, Pl. XXII, XXIII); *Clathrocystis roseo-persicina*, Cohn, (Rabh. Alg. Europ. No. 2318 and Beitr. z. Biol, I. Bd. 3, p. 157, Taf. VI, Fig. 1-10.)

Exsiccata: Rabh. Algen Sachsens, etc., 986 und 2318; Wartmann und Schenk, Schweiz' Kryptog, 343.

Cells globular, oval, or through mutual pressure, polygonal; from rose to purple-red; .00010 in. in diameter. They form at the beginning little solid families in which the single cells are joined by gelatine, while the whole family is inclosed in a gelatinous envelope. Later, there forms a larger, globular or oval, finally irregular, hollow body, attaining a diameter .02640 in., and filled with a watery liquid. In this the cells are arranged in a single peripheral layer. These bladders are often torn or perforated, becoming elegant nets, which finally break up into irregular patches and shreds.

In swamps, swimming on the surface or among algæ and duckweeds; often also in aquaria, in which algæ, etc., are decomposing.

The only species of this genus, so far known, is remarkable for its red coloring matter which is essentially different from that of *Micrococcus prodigiosus*, and is known as "bacterio-purpurin." This is insoluble in water, alcohol, etc., is changed by hot alcohol into a brown substance, and is otherwise characteristic by its optical deportment. It shows through the spectroscope the same strong absorption band in the yellow; weaker ones in the green and blue, as well as the darkening of the more refrangible half of the spectrum. The single cell is surrounded by a firm, almost cartilaginuous membrane; their contents are, when young, homogeneous, but when older there appears within, one or more opaque granules, which are none other than metallic sulphur.

SARCINA, GOODSIR, (Extended).

Cells globular, dividing in two or three planes; daughter cells a long time united, forming little solid or tabular families, which are often again united into larger colonies. As a rule, the families consist of four, or some multiple of four cells.

S. ventriculi, Goodsir.

Synonyms: *Merismopedia Goodsirii*, Husem (de anim. et veg., p. 13). *M. ventriculi*, Robin (Hist. des Végét. paras., p. 331, T. I, Fig. 8, et T. XII, Fig. 1).

Exsiccata: Rabh. Algen 600. Wartmann und Schenk, Schweiz. Kryptog, 247.

Cells globular, four, eight, sixteen or a few more united into little cubes with rounded corners—the parts in contact flattened; cells of the colony attaining a diameter of .00016 in.; colonies strung together by the partition walls of the cells; again united into larger masses. Cell contents greenish, yellowish or reddish-brown, somewhat polished.

In the stomach of healthy and diseased man and higher animals; also sometime occurring in other parts of the body.

S. urinæ, Welcker.

Synonym: *Merismopedia urinœ*, Rabh. (Flora Europ. Alg. II, p. 59).

Cells very small, .00004 to .00008 in. in diameter, eight to sixty-four united in a family; eight united cells .00008 to .00012 in., sixty-four cells .00016 to .00020 in. in diameter.

In the bladder.

S. littoralis, Winter.

Synonyms: *Erythroconis litoralis*, Oersted; *Merismopedia litoralis*, Rabh. (Flora Europ. Alg. II, p. 57).

Cells globular or, when ready to divide, oval; .000042 in., seldom .00008 in. or more in diameter; united in families of four, six, eight, etc., which are again grouped in larger colonies (as many as sixty-four 4-parted cells). Cell contents colorless, but there is in each cell one to four red granules of sulphur.

In putrid sea-water.

S. Reitenbachii, Winter.

Synonym: *Merismopedium Reitenbachii*, Caspary (Schriften der physikal, ökon, Gefellschaft zu Königsberg, XV, 1874, p. 104, T. II, Fig. 7 to 15).

Cells globular, or when ready to divide, oval or elliptical, .00006 to .00010 in diameter, dividing ones attaining .00016 in. long; rarely single or in twos or threes, usually four or eight, or more often sixteen or more united. Cell wall colorless, with the forming wall-borders rose-red.

On the submerged parts of aquatic plants and dead sticks, and swimming free in fresh water.

The families consist at most of thirty-two cells; those of eight globular cells measure .00040 in. long, .000175 in. wide; tabular families of eight cells .00026 in. long, and .000175 in. wide. while those of sixteen cells are .00066 long and .00043 wide.

Probably also *Merismopedia vialacea* (Brëb.) Kûtzing, (Spec. Alg. p. 472, und Tabul. phyc. v. T. 38, Fig. 7; Rabenhorst Flora Europ. Alg. II, p. 57) belongs to the Fungi. This agrees in its large size nearly with *Sarcina Reitenbachii*. yet differs on account of the color, especially as not rarely one hundred and twenty-eight cells are united in a family. Very similar, but hitherto perhaps only found in Sweden, is *Merismopedia chondroideum*, Wittr. (Wittr et Nordstedt, Algæ Exsiccata, 200).

S. hyalina, Winter,

Synonym: *Merismopedia hyalina*, Kûtz.

Cells globular, almost colorless, .00006 in. in diameter; families mostly of four to twenty-four (rarely more) united cells, attaining .00060 in. in diameter.

In swamps.

Sarcina renis. Henworth (Mic. Jour., v. 1857, p. 1, pl. 1, Fig. 2), is bright-green; it shows little connection with the species of this genus, therefore I shall only mention it.

Besides the foregoing species of *Sarcina* there are those hitherto classed as fungi on various substrata; on boiled potatoes (in little chrome yellow masses,) on cooked white of egg (bright yellow spots), also in solutions, and even in the blood of healthy and diseased human beings. Compare Cohn's Beitr. zur Biologie I, Bd. 2, p. 139.

BACTERIUM, Cohn.

Cells short-cylindrical, long-elliptical or fusiform; increasing by transverse division; having the power of moving spontaneously. The daughter cells separate soon after the division or remain attached in pairs or in a greater number forming a chain; frequently forming zooglœa; formation of spores similar to that of *Bacillus*.

[Aside from their shape the species of this genus mainly differ from those of *Micrococcus* in their power of movement. While the latter oscillate and tip and turn in the suspending fluid, but make no advance, the former freely move from place to place. Of these the motion is of every kind: rolling, spinning, turning end over end, swaying as if attacked at one end by an invisible thread, quivering without change of place, sailing steadily and stately, darting like a flash, whirling, bobbing, dancing—a maze and labyrinth of movement. But these active motions are observed only when the organisms are in a rich nutritive fluid and are supplied with free oxygen. The zooglæa differ from those of *Micrococcus* in having a firmer and more abundant intercellular substance.]

B. termo, Dujard.

Synonyms: *Monas termo*, Muller (Infus. T. I, Fig. 1—non Ehrb.); (?) *Palmella infusionum*, Ehrb. (Inf. p. 526). *Zooglœa termo*, Cohn (Nova Acta Acad. Caes. Leop. Carol. XXIV, Bd. 1, p. 123, T. 15, Fig. 9).

Exsiccata: Thümen Mycotheca Universalis, 1000.

Cells short-cylindrical, oblong; .00006 to .00008 in. long [.00008 to .00012 in. long, .000025 to .00012 in. wide, Magnin]; furnished at each end with a cilium.

In all putrescible substances, especially water in which meat is macerated.

Bacterium termo is the ferment of putrefaction; it produces putrefaction of organic substances, and rapidly multiplies itself as long as the substances capable of putrefaction are present, while it disappears as soon as the decomposition is ended. It is certainly obtained when a piece of meat is put into water in a vessel left open and allowed to stand in a warm place. The reproductive power is so enormous that the bacteria cells reaching the liquid through the air, or as attached to the meat, have, in a short time, so great a progeny that in twenty-four hours the water has a conspicuous milky appearance, caused by the swimming fungi. That the *Bacterium* is the cause, and not simply an accompaniment of the putrefaction, is made apparent by a simple experiment. Putrefaction begins as soon as air is allowed to freely pass to a putrescible substance, because the air always contains a number of the bacterium cells. But when the putrescible substance is heated over 50° Cent., and the air excluded, it does not ferment. It can be objected that the air, or the oxygen of the same, causes the putrefaction, but this can be readily refuted. Air filtered through cotton-wool, and thus freed from the bacterian cells, can easily be passed to a putrescible liquid which has been highly heated; in this case no putrefaction takes place.

B. lineola, Cohn.

Synonym: *Vibrio lineola*, Müller (Vermium Historia, p. 39).
Bacterium triloculare, Ehrb. (Infs., p. 79).

Cells similar to those of *Bacterium termo*, but larger; .00012 to .00015 in. long by .00006 in. wide; with two cilia at one end.

In various infusions without producing a special fermentation.

[Takes the form of zoogloea in which the rods are motionless. Its protoplasm is often studded with dark granules. This is the only statement known to the translator concerning the *two cilia*, and his own observations have failed to confirm it.]

B. litoreum, Warming.

Cells ellipsoidal or elongated, usually rounded at the ends, .00008 to .00024 in. long, .00005 to .00010 in. wide; colorless; motile or still, but never united in chains or zoogloea, nor in large masses.

B. fusiforme, Warming.

Cells fusiform with sharpened ends .00008 to .00020 in. long, .00002 to .00003 in. wide.

In a loose layer on the surface of sea water.

B. navicula, Reinke and Berthold. (Die zetsetzung der Kartoffel durch Pilze, p. 21, T. VII., Fig. 10.)

Cells fusiform or elliptic, diminished at each end; rather large; motile or at rest; having within one or more opaque granules which are colored blue with iodine.

In moist-rotting potato.

B. synxanthum, Schroeter.

Synonyms: *Vibrio synxanthus*, Ehrb. (Bericht über die Verhandl. der Berl. Akademie 1840, p. 202, No. 54). *Vibrio xanthogenus*, Tchs. (Magaz. f. d. ges. Thierheilkunde, Bd. VII, p. 194.)

Not different in form from *Bacterium termo*; .00003 to .00004 in. long; motions lively; single or as many as five united in a chain.

Causing the so-called yellow milk.

Boiled milk becoming after a time coagulated often suddenly turns citron-yellow; the casein gradually disappears until very little remains. The milk, at first neutral becomes sour, then intensely alkaline. The filtered citron-yellow liquid becomes by evaporation amber-yellow; the resulting yellow-brown crust is insoluble in alcohol and ether, but entirely soluble in water. Alkalies do not change its color, while acids cause instant decolorization.

B. syncyanum, Schroeter.

Synonyms: *Vibrio syncyanus*, Ehrb. (l. c. p. 124 und 126), *Vibrio cyanogenus*, Tchs. (l. c. p. 190).

Like the preceding in form.

Producing "blue milk."

The coloring matter is changed by alkalies to peach or blood red, while acids restore the original color. Ammonia, in turn, only changes the blue to a violet tint.

B. aeruginosum, Schroeter.

In the so-called green (or blue) pus sometimes found in wounds, etc.

The cells themselves are also colorless in this case; they impart the verdigris-green (often changing into blue) coloring matter to the surrounding medium.

[**B. punctum,** Ehrb.

Cells elongated, ovoid, colorless, often in pairs; movements slow and oscillating; length .00021 in., thickness .00007 in.

In infusions of animal substances.

B. catenula, Duj.

Cells cylindrical filiform, often three, four or five united; length .00012 to .00016 in., thickness .00002 in.

In fetid infusions and in typhoid fever (Coze and Feltz.)

This and the preceding are taken (translated from the French) from Magnin's work on *Bacteria*, but they are put down as doubtful species. They seem from the shape of the cells to belong rather to *Bacillus*.

The four following, also copied from Magnin, are said by him to require further study, though apparently species of *Bacterium:*

Vibrio lactic, Pasteur.

Cells almost globular, very short, a little swollen at the extremities; length, .000064 in. in a series; .00200 in. long.

Develops, according to Pasteur, in sweet liquids, in which it causes the formation of acetic acid and in milk the coagulation of the casein. According to other researches the coagulation of the casein is influenced by a soluble (zymase), and not an organized, ferment.

Mycoderma aceti, Pasteur.

Synonym: *Ulvina aceti*, Ktg.
Exsiccata: Thümen Mycotheca Universalis 1599.

Cells short, narrowed in the middle, often united in long chains, forming a pellicle on the surface of liquids; length of a cell .00006 in., which is two or three times the width.

This species is thus very near the preceding; it should not be confounded with *Mycoderma vini*, which may develop in the same liquids, but which belongs to the *Saccharomycetes*.

Vibrio tartaric right, Pasteur.

Cells globular, short, .00004 in., united in chains about .00200 in. long; similar to the preceding.

Decomposes racemic acid, causing right tartaric acid to disappear, and liberating left tartaric acid.

The acid fermentation of beer.

Cohn thinks this is due to a *Bacterium* similar to *B. termo*, but a little larger. He has found it with oval *Saccharomycetes* in acid beer—elliptical *Bacteria* endowed with motion, often united in pairs, rarely in fours].

BACILLUS, Cohn.

(Beitr. z. Biol. I, Bd. 2, Hefl. p. 173).

Cells elongated cylindrical, almost always attached together in straight rod-like (*stielrunden*) rows or threads (not or little interlaced); multiplying by transverse division. They form zoogloea, but often also occur united in thick swarms without gelatinous secretion. Propagation by spores.

The genus *Bacillus* is closely related to *Bacterium*; especially is *Bacterium lineola* with united cells very similar to *Bacillus* rods. Yet there is this difference, that in the longer *Bacterium* cells the appearance of dividing is perceptible, while in the *Bacillus* cells of equal length it is not.

Some of the species are always motionless, some are spontaneously motile, but go into a resting condition. The rod-like cells elongate by intercalary growth to about double the typical length, and then divide by a transverse partition into two daughter cells, which often separate from each other, but often also remain attached. When the products of repeated division continue joined together filaments are produced, which are zigzag or

straight, apparently jointless, but the cells become apparent by the use of coloring matters. In the formation of spores the greater part of the cell-contents collects in one place of the rod, which often swells at the point, and the protoplasmic contents becomes sharply defined from that of the rest of the cell. Later, this highly refractive, dark-appearing body (the spore) separates from the sterile part of the cell, and falls to the ground; the ripened spore continues to remain apart. These spores possess the ability to endure unfavorable influences of various kinds, without detriment to their vitality. They can remain a long time in the soil, often many years, before beginning to grow, but also have the power to germinate at once. In germination, the spore first loses its polished appearance and swells a little; the cell-wall then splits around the middle of the spore. Through the opening thus made the spore protrudes by the arching of its substance, and grows into a new rod, to the base of which the old cell wall of the spore adheres, and is often thrown off only at a late period.

The determination of the different species is also here very difficult.

B. subtilis, Cohn.

Synonym: *Vibrio subtilis*, Ehrb. (Infs. p. 80, No. 91. T. V., Fig. 6).
Exsiccata: Thümen Mycotheca Universalis, 1200.

Cells cylindrical, about twice as long as thick, attaining .00024 in. long; bearing a cilium at each end. Mostly several cells, joined into apparent filaments which are motile, flexible and are furnished at each end with a cilium. The spore-forming cells are three to four times as long as thick, isolated or united in filaments. The spores are usually somewhat greater in diameter than the rods.

In different infusions and substances—very probably in the rennet stomach of living ruminants. According to Cohn, the producer of butyric fermentation, and also the active principle in the ripening of cheese.

The extraordinarily great power of resistance of the spores of Bacillus subtilis and the other species is a peculiar property. They are not killed by boiling, but made to germinate very quickly, though the duration of the boiling must of course be considered. Fifteen minutes boiling does them absolutely no harm, while most are killed after one hour and all after two hours' boiling. They are insensible to poisons and weak acids.

B. tremulus, Koch.

Very similar to the preceding but more slender and mostly shorter, always with a cilium at each end. Spores plainly thicker than the cells, often arranged in lines.

On the surface of foul vegetable infusions, forming a thick slimy layer.

B. amylobacter, Van Tieghem.

Synonym: *Closterdium butyricum*, Praz.
Exsicatta: Thümen Mycotheca Universalis, 1800.

Morphologically similar to *Bacillus subtilis*, but distinguished by the fact that at certain times it contains starch in its cell-contents as can be easily proved by the addition of iodine.

In the cells of plants having milk-sap, in foul vegetable infusions, etc.

According to Van Tieghem's first communication this species is the producer of cellulose fermentation. Later *Bacillus amylobacter* (not *B. subtilis*) was pointed out by him and Prazmowski, (Botan. Zeitung, 1879, No. 26) as the cause of butyric acid fermentation (Vibrion butyrique, Pasteur). According to Prazmowski, *B. amylobacter* is distinguished especially and essentially from *B. subtilis* in the manner of the germination of the spores. In the first species the germinal tube does not appear at the equator, but at one end of the spore. But to found a new genus upon this, as proposed by Prazmowski, does not seem to me advisable.

[Trecul has held that this organism originates within the closed cells of plants by a direct transformation of the protoplasm, an idea combatted by Van Tieghem. (Comptes Rendus, t. 88, p. 205; t. 61, pp. 156 and 436; t. 65, p. 513)].

B. ulna, Cohn.

Filaments thicker than in *Bacillus subtilis*, somewhat flexible, with dense, finely granular protoplasm. A single cell attaining .00040 in. length, .00098 in. wide. Spores oblong cylindrical.

In various infusions, for example in the white of egg.

Appears to be scarcely different from *Bacillus subtilis*; intermediate forms between them have been observed.

B. anthracis, Cohn.

Exsiccata: Thümen Universalis, 1499.

Very similar to *Bacillus subtilis*, but motionless and without cilia; cells .00016 in. long and longer, very slender, mostly extended; often united in crooked filaments. Spores not, or but little thicker than the threads.

In the blood of animals which have died with splenic fever (Anthrax, Miltzbrand); the cause of splenic fever in cattle, sheep, etc., and malignant pustule in man.

Bacillus anthracis and the disease symptoms caused by the organisms are, among all pathological processes induced by Schizomycetes, the most accurately investigated. The *Bacilli* are found without exception in the blood of animals dead from splenic fever and the proof has now been sought and found that they are the *cause* of the disease. So long as only the vegetative rods were known it was difficult to gain this evidence; for these retain their vitality only a comparatively short time and blood containing only these soon loses its power of infection. The remarkable thing about splenic fever is that it often occurs very suddenly in a region, then disappears for a long time to reappear just as unexpectedly, without any transmission having been allowed. From this fact it is to be inferred that the contagion can retain its virulence a long time. The discovery of the spores of *Bacillus anthracis*, which form only in the blood of dead animals or when the blood of animals sick with splenic fever has been a long time dried, explains this power of long duration. For as the spores of *Bacillus anthracis* possess a great power of resistance to outside influences, especially dryness, they are capable of developing after many years. They are often produced within the buried bodies of animals dying with the disease, and from these they may be diffused in various ways. Then if in any manner they reach the bodies and gain entrance to the blood of cattle, etc., they germinate, reproducing the rods which multiply richly and soon begin their destructive activity.

[Recent investigations (1881–1882) have added further information upon and new interest to this species. It seems well established that *Bacillus subtilis* may, by graded cultivations, be physiologically changed, so that it is capable of developing in the blood of living animals and thus become the cause of disease; but such changes do not take place suddenly and seldom occur in nature, though the possibility of the latter may explain what has heretofore been mysterious and perplexing. But by far greater scientific and practical interest is attached to the results of modifications through artificial cultivation of *Bacillus anthracis* itself. By cultivating the deadly organism in well aerated chicken or other broth at a certain temperature, the virulence of its physiological effects is gradually lost, but may be restored after several generations by equally feasible methods. The practical importance of this is at once seen to be very great when it is further made known that the organism modified by habit to a harmless condition constitutes a protective virus which, after inoculation, relieves the animal from danger however exposed to the *Bacillus* in its malignant state. Some account of this has been given on a preceding page, and the matter has been widely published in recent periodical literature. No greater contribution has ever been made to pathological and medicinal knowledge, and the good results already attained opens boundless anticipations of mastery over other ills that flesh is heir to. Pasteur supposed he had conclusive proof that the spores buried with dead animals retained their vitality during ten or more years, but the changes now known possible in other species renders the evidence less valuable.]

B. ruber, Frank and Cohn.

Exsiccata: Rabenhorst, Algen 2441.

Rods .00024 to .00032 in. long, scarcely .00004 in. thick, actively moving, isolated or united in twos or fours. Rods (cells) just divided sometimes shorter, only .00012 to .00016 in. long. Imparting a brick-red pigment, different from that of *Micrococcus prodigiosus*.

On boiled rice.

B. erythrosporus, Cohn.

Motile, short, slender rods, forming sometimes longer filaments in which originate numerous, oblong-oval, highly polished, dirty-red spores.

On solutions of beef extract, putrid infusions of white of egg and of meat.

This species forms in part little swimming scales, in part a continuous pellicle; the filaments at length decompose into a gelatinous mass whereby the spores are liberated, which now united in little gelatinous masses sink to the bottom. The species is easily recognized by the dirty-red color of the spores.

[B. of tuberculosis.

Cells very slender, cylindrical, about .00002 in. wide, .00010 to .00012 in. long, isolated or in chains of a few articles; motionless; sometimes containing spores which, from their size, cause slight fusiform swellings of the containing cell.

That this dreaded scourge of the human family as well as of the higher animals is infectious has of late been repeatedly shown, and the most careful search has been made for the organism which, from analogy, was supposed to constitute the *materies morbi*. After many failures on the part of numerous investigators, Dr. R. Koch, of Berlin, succeeded, by a special method of preparation, in discovering the minute species characterized above. In order to see the Bacillus it is first stained as follows: Smear a cover glass with the tuberculous matter (sputa or a small portion of tubercle), dry over a lamp; float the smeared cover several hours (24) on—a concentrated alcoholic solution of methylene-blue 1 part, a ten per cent. solution of potash 2 parts, distilled water 200 parts; wash, and treat with a few drops of aqueous solution of vesuvin. The Bacilli retain the blue, while the rest of the material does not. Now that we know what to look for, the organisms can be seen without staining, but they are very indistinct. The common violet stain of the accompanying material somewhat aids—the Bacilli showing white.

Abundant experiments by Koch and others, have shown that these Bacilli are the true agents in the wasteful processes of the disease—the real cause of consumption in man and animals. It is also demonstrated that they do not develop in nature outside of the living body, hence that the disease is only communicated from the diseased; and, further, that the supposed hereditary peculiarities consist simply and only in the organic inability to resist infection. The children of consumptive parents may remain healthy if kept away from diseased individuals and their excretions].

[B. lepræ, Hansen.

Cells slender, elongated, .00016 in. long, .00004 in. wide; isolated or united in chains of a few articles, often arranged side by side; motionless.

In any or all tissues of the body of those afflicted with leprosy.

The investigations of Hansen, Neisser and others, have fully established the cause of this scourge of the human family in various parts of the world. The contagious character of the disease was among the earliest recognized, and has long been fully understood; but in what the contagion consists, has been entirely unknown until our own time. It is now added to the increasing list of known affectations due to the injurious activities of minute parasites which we are just beginning to know and understand. *Bacillus leprœ*, like the preceding, is nearly invisible without staining, but is readily seen after treatment with aniline dyes in the manner just given].

[B. of foot-rot in sheep.

Cells cylindrical .00012 to .00016 in. long, isolated or more generally united in pairs, of which one cell is larger than the other; actively motile.

In pustules in tissues of animals affected with above named disease.

The course of the disease occupies about thirty-five days. In the vegetative stage the organisms are very active, but in liquids (broth of rabbit or mutton) from which the nutriment is nearly exhausted the larger cell of a pair produces a spore at each end and sometimes one in the middle, the smaller cell produces one spore of larger size, about .00004 in. in diameter. The spores, as in other cases, sink to the bottom as a white sediment. Upon inoculations with this material pustules are formed which reach their greatest size in about eighteen days. They never suppurate and appear to be local in effect, though the temperature of the animal rises somewhat by the fifteenth day. (Comptes Rendus. xcii, 1881, pp. 362-4.)]

LEPTOTHRIX, Kutzing (Emend).

Filaments very long and slender, unbranched, apparently not jointed, colorless, motionless, without granules, free or felted.

The fungi referred to the genus *Leptothrix* are, with reference to their specific value, very questionable; I place here the following kinds only provisionally. *Leptothrix* species very commonly occur with those of *Bacillus*. Since the genus will probably have a place among the fungi only a short time, I will not give it a new name. The greater number of the species are typical phycochromous algæ.

[Treatment with iodine renders the articulations very distinct].

L. buccalis, Robin.

Filaments very long and slender .000028 to .00004 in. (seldom something more) in diameter; jointless, colorless; felted into dense white masses.

Mixed with *Micrococci* (usually also *Vibrio*, etc.,) in the white slime on the teeth, on the epithelium of the mouth and in hollow teeth. Probably the cause of caries (rotting) of the teeth.

The seat of the fungus is especially in the canals of the tooth-bone (the dentine pipe); but it seizes also upon the substance of the enamel which it gradually destroys. In the canals the fungus produces marked enlargement, later the walls themselves become penetrated by fissures and chinks and broken in pieces.

L. parasitica, Kütz.

Filaments very slender, mostly curled and crisped, obscurely jointed; loosely felted, nearly colorless; .004 to .0056 in. long, .00004 in. thick.

Parasitic on *Scytonemaceæ* and other related *Algæ*.

Leptothrix pusilla, Rabh, and *L. lanugo*, Kütz, are, perhaps, also to be accounted Fungi.

BEGGIATOA, Trevisan.

Filaments very long but thicker than those of *Leptothrix*, usually obscurely jointed, quite rigid but actively oscillating, imbedded in jelly, colorless, with numerous highly refractive granules in the protoplasm which consists of sulphur.

The genus *Beggiatoa* is easily recognized by the chalk-white slime-forming, actively moving filaments, whose joints cannot as a rule be distinguished without special processes. In order to see them it is necessary to let the filaments dry on the microscopic slide and then apply bisulphide of carbon, which gradually dissolves the granules of sulphur which in the living plant obscures the joints. The species of *Beggiatoa* live for the most part in thermal

sulphur springs where they decompose, the dissolved sulphur compounds in the water and give off free sulphureted hydrogen. For this reason such water with *Beggiatoa* put into a stoppered bottle, develops an extremely intense odor of sulphureted hydrogen.

The supposed species of *Beggiatoa* are of very uncertain value; they are distinguished by very little else than the diameter of the threads.

B. alba, Trev.

Synonyms: *Beggiatoa punctata,* Trev. (Flora Enganea, p. 56); *Oscillaria alba,* Vauch (Confery, p. 198, T. XV, Fig. 11); *Hygrocrocis Vandelli,* Menegh, (Kützing's Algæ exsc. No. 16—Tab. phycol. I, T. XXXVIII, Fig. 3).

Exsiccata: Wartmann und Schenk, Schweiz. Kryptog. 639.

Filaments without evident joints, forming dirty or chalky-white slimy masses; .00012 to .00014 in. thick.

In sulphur springs and swamps.

Var. marina, Cohn.

Filaments densely filled with blackish granules, only .00008 thick.

In a salt-water aquarium, forming a snow-white, then slimy membrane on dead animals and algæ.

B. nivea, Rabh.

Synonym: *Leptonema niveum,* Rabh. (Alg. Decad. 653).

Filaments very slender, obscurely jointed; .00004 to .00006 in. thick (according to Rabenhorst) forming flocks of snow-white color.

In sulphur springs.

In Wartmann and Schenk's Swiss Cryptogams, 639, this species is given under the name of *Symphyothrix nivea,* Brügger. Both the above names are cited, *pari passu,* as synonyms. I take the following from their description: "Filaments not polished, without joints, also without movement, only .00002 to .000052 thick, parallel and variously entwined, united in pencil-like tufts, strings and bundles of very unequal thickness, which are enveloped in a common, homogeneous slime-mass."

B. leptomitiformis, Trev.

Synonym: *Oscillaria leptomitiformis,* Menegh. (Ragazz. Nuovo ricercli. fisico-chim. p. 122.—Kutzing, Tab. phycol. I, T. XXXVIII, Fig. 1.)

Exsiccata: Rabenhorst's Algen, 1813.

Filaments very slender, obscurely jointed, .00007 to .00010 in. thick; forming a thin chalk-white slimy layer.

In sulphur springs.

B. archnoidea, Rabh.

Synonyms: *Oscillaria archnoidea,* Ag, (Regensb. "Flora," 1827, p. 634, No. 38.) *Oscillaria versatilis,* Kutz. (Phycol. gener. p. 184).

Filaments rather thick, evidently jointed, with rounded, slightly curved ends; movements active. Joints as long, or half as long as thick. Filaments .00020 to .00026 in. thick, forming a very thin, cob-webby, chalk-white, slimy pellicle.

In sulphur springs and swamps.

B. pellucida, Cohn, (Hedwigia 1865, p. 82, T. I, Fig. 2.)

Filaments .00020 in. thick, motile, evidently articulated, with rounded ends; joints scarcely as long as thick; pellucid, containing but few granules.

In a salt-water aquarium.

B. mirabilis, Cohn, (l. c. p. 81, T. I, Fig. 1.)

Filaments thick, variously crooked and curled, with rounded ends, evidently articulated; attaining .00064 in. thick; joints half as long as thick, filled with numerous rather large granules. Threads twisted and woven through each other, forming a snow-white, slimy web.

With the preceding.

DOUBTFUL SPECIES.

B. tigrina, Rabh. (Flora Europ. Alg. II, p. 95.)

Synonym: *Oscillaria tigrina*, Römer (Die Algen, Deutchlands p. 58.)

Filaments rather thick, oscillating, evidently jointed, with slight and obtuse curves, now and then suddenly reduced in size, with rounded ends; pellucid, .00014 to .00018 in. thick; forming a thin white layer.

In swamps and on wood under water.

B. minima, Warm.

Very small, flexible and actively moving; the longest .0016 in. .00007 to .00008 thick; jointed; distinguished by the order of the delicate stripes. Each joint about half as long as wide. Without granules.

In sea-water.

CLADOTHRIX, Cohn.

(Streptothrix, Cohn, Beitr. z. Biol. Bd. I, Heft 3, p. 204.)

Filaments leptothrix-like, very slender, colorless, without joints, straight or slightly undulating, or irregularly spirally wound, with apparent branches.

I am unable to find a satisfactory difference between the genera *Cladothrix* and *Streptothrix*. Both are very doubtful genera. Compare Cienkowski's "Zur Morphologie der Bacterien" (Memoires de l' Acad. imp. d. Sciences de St. Petersbourg. VII Sér. Tome XXV, No. 2, p. 11.)

C. dichotoma, Cohn.

Filaments repeatedly dichotomously branched, straight or slightly bent, .000012 thick, forming little webs (Räschen) .02 in. and more in diameter.

In foul water, sometimes floating on the surface, sometimes attached to algæ.

The branching in this case, as with *Cladothrix Forsteri*, is only apparent. The filament split themselves into two halfs, which independently elongate and so grow side by side; in this way the separated pieces are crowded to one side and appear as branches.

C. Forsteri, Winter.

Synonym: *Streptothrix Forsteri,* Cohn. (Beitr. z. Biol. I, 3 Heft., p. 186 und 204.

Filaments straight or curved, irregularly spirally twisted, sparsely and irregularly branched, occurring in pieces of various lengths.

In the lachrymal ducts of human eyes, forming greasy or crumbling yellowish-white or blackish concretions, .125 to .25 in. long, .083 in. thick.

MYCONOSTOC, Cohn.

(l. c. p. 183 und 204.)

Filaments very slender, colorless, not jointed, but upon drying separating into short cylindrical articulations, variously curved and entwined, imbedded in jelly, forming globules from .00040 to .00068 in. in diameter.

Multiplying by the infolding and the division of the globules of jelly in two parts.

M. gregarium, Cohn.

Gelatinous globules, floating on the surface of foul waters, single or aggregated in little slimy drops, with the circumference sharply defined.

On water in which there are decomposing algæ.

SPIROCHÆTA, Ehrb.

(Abhaudl. d. Berlin. Acad. 1833, p. 313).

Cells united in long slender threads, mostly showing narrow spiral windings. The filaments have the liveliest movements, and clearly propel themselves forward and backward, but are also able to bend in various ways. Forming no zoogloœ, but often felted in dense clusters.

Differs from *Spirillum* by the long, narrowly-wound, flexible threads.

S. plicatilis, Ehrb.

Synonym: *Spirillum plicatile,* Duj. (Infs. p. 225, T. I, Fig. 10).

Spirulina plicatilis, Cohn. (Nova Acta Acad, Caes. Leopold; Carroll, XXIV, I, p. 125, T. XV, Fig. 10, 11).

Filaments very short and slender, with numerous narrow spiral turns; jointed, obtuse at the ends, .00440 to .00900 in. long (according to Rabenhorst); diameter, .00009 in. (according to Ehrenberg).

In swamp water, among algæ.

This species differs, according to Koch, from the others, by the double spiral formed by the filaments. Yet threads wound in a continuous spiral are very common.

S. Obermeieri, Cohn.

Very similar to *Spirochæta plicatilis* in form, only differing by the filaments being sharply pointed at both ends.

In the blood of the sick with recurrent fever, and apparently the cause of the sickness.

The filaments of *Spirochæta Obermeieri* are either extended and regularly spirally wound, or they are bent, so that the spirals appear irregular, especially in the parts most crooked, rapidly moving in various ways. This species is found in the blood of persons having recurrent fever, and really only during the returning access (onset) of the fever or a short time thereafter. They disappear in the periods between the paroxsms of the fever. [The former investigations have been confirmed by extensive observations in India, where relapsing fever is now very common. See volume on "Spirillum Fever," by Dr. Vandyke Carter, London, 1882.]

S. Cohnii, Winter.

Very similar to both the foregoing species, but always shorter and usually also more slender, like *Spirochæta Obermeieri* sharply pointed at both ends.

In mucus on the teeth; discovered by Cohn, figured by Koch (Beitr. z. Biol. II, Bd. 3, Heft., T. XIV, Fig. 8).

S. gigantea, Warming.

Filaments cylindrical, obtuse at both ends, about .00012 in. thick, with numerous spiral turns of a diameter of .00028 to .00036 in. and length of each .001 in.; flexible; the articulations are not apparent, but the threads sometimes separate into joints. The longest have sixteen spiral turns; cilia have not been found.

In sea water.

SPIROMONAS, Perty.

(Zur Kenntniss der Kleinsten Lebensformen, p. 171.)

Cells leaf-like (flat), compressed, twisted around an ideal longitudinal axis; multiplying by transverse division.

S. volubilis, Perty.

Colorless, pellucid, polished, without in any part special differentiation; movements quite rapid, turning upon the axis upon which the leaf-like body is wound. Body often very little twisted, never forming more than one spiral turn; length .00060 to .00070 in.

In stagnant swamp water and foul infusions.

S. Cohnii, Warming.

Cells flattened, but sometimes scarcely angular, sharply pointed at both ends and always furnished with a cilium, having one and a fourth (rarely more) spiral turns; these six to nine times as high as their diameter; height .00036 to .00080 in., diameter .00005 to .00014 in. Thickness of the cells .00005 to .00016 in.; colorless, often with one or two longitudinal stripes.

In ill-scented, very strongly fermenting water.

SPIRILLUM, Ehrb.

(Abhand. d. Berl. Akad. 1830, p. 38).

Vibrio, Cohn. (Beitr. z Biol. I, Bd. 2, Heft, p. 178.)
Ophidomonas, Ehrb. (Infs. p. 43.)

Cells cylindrical or somewhat compressed, with a single arch-form curve or spirally wound; rigid; furnished at each end with a cilium (not certainly observed in all the species); multiplying by transverse division, the parts soon separating from each other. The formation of zoöglœa and of spores as in the species of *Bacillus* sometimes occurs.

I unite with *Spirillum* the genera *Vibrio*, Cohn, *Ophidomonas*, Ehrb. The genus *Vibrio* does not indeed permit of sharp definition since their cilia have been found. Cohn himself has united *Ophidomas* with *Spirillum*. Warming also shows that all three genera are the same. Although the name *Vibrio* has the priority, I have chosen *Spirillum* because with the first, aside from its being non-botanical, misuse has been practiced, so that it is better to drop it altogether.

S. rugula, Winter.

Synonyms: *Vibrio rugula*, Muller (Infs. p. 44, T. VI, Fig. 2.) *Melanella flexuosa*, Bory (Encycl. method, 1824.)

Cells .00024 to .00064 in. long, .00002 to .00010 in. thick; either only one curve or one flattened spiral turn, bearing a cilium at each end, actively rotating around their long axis; the cells often felted into dense swarms; height of a spiral mostly .00024 to .00040 in., diameter .00004 to .00008 in.; globular spores always formed at the ends of the cells.

In swamp water and various infusions; also in the slimy material on the teeth, &c.

According to Warming some specimens attain a height of single spiral of .00050 to .00080 in., and diameter of .00010 to .00020 in.

S. serpens, Winter.

Synonym: *Vibrio serpens*, Muller (Infs. T. VI, Fig. 7 and 8.)

Cells half as thick as the preceding species, .00045 to .00112 in. long (according to Rabenhorst) .00003 to .000045 in. thick, with more usually three to four spiral turns; often joined in long chains; furnished with a cilium at each end; also often collected in swarms; height of a single spiral .00030 to .00050 in.; diameter, .00005 to .00012 in.

In various infusions.

Rabenhorst's measurement of the length, .00092 to .00112 in., probably applies to the whole filament consisting of several cells. According to Warming the height of a single spiral sometimes attains .00088 in.

S. tenue, Ehrb. (Infs. p. 84, T. V, Fig. 11).

Cells very slender, .00016 to .00060 in. long, .00010 in. thick (according to Ehrenberg), with at least one and a half, usually two,

three, four or five spiral turns; height of a single turn of the spiral, .00006 to .00016 in.; diameter, from one-half to the same; movements very active, but also without motion; collected in dense swarms or masses, or forming zooglœa.

In various infusions.

According to Warming only .00004 in. thick, and the distance of the turns of the spiral sometimes .00032 to .00040 in.; their diameter only one-eighth to one-tenth this measurement. A confusion appears to prevail in respect to *Spirillum tenue* and *Sp. undula.*

S. undula, Ehrb.

Synonyms: *Vibrio undula*, Müller (Vermium historia, p. 43). *Vibrio prolifer*, Ehrb. (Infs. p. 81, T. V. Fig. 8.)

Cells .00032 to .00048 in. long, .000044 to .000056 in. thick (Rabenhorst; spiral wider than the preceding; turns .00016 to .00020 in. distant; each cell usually having only one-half or one, rarely two or three spiral turns; furnished at each end with a cilium; motions very active; sometimes also forming zooglœa.

In swamp water and in various infusions.

Ehrenberg gave for *Spirillum tenue* a thickness of 1-1000 of a Prussian line, and for *Sp. undula* only 1-1680 of a line; he also said in the description: *"Sp. fibris valde tortuosis brevibus, validioribus."*

According to Warming, *Spirillum tenue* is more variable than has been hitherto supposed. The turns of the spiral are often very long, so that the cell appears almost straight, therefore the distance between them varies from .00012 to .00042 in., with a diameter from one-tenth to three-fourths of this measurement; the thickness of the cell is from .000024 to .00005.

Var. litorale, Warming.

Attains .00012 in. thick, length of one turn of the spiral form .00020 to .00040 in., and diameter from one-sixth to one-fourth as much.

On the coast of the Baltic sea.

S. volutans, Ehrb.

Synonyms: *Vibrio spirillum*, Müller (Infs. p. 49, T. VI. Fig. 9). *Melanella spirillum*, Bory (Encycl. method.)

Cells somewhat tapering at the ends, gradually rounded, .00100 to .00120 in. long, .00006 to .00008 in. thick; each cell with two and a half to three and a half spiral turns, each of which is .00036 to .00050 in. high, .00026 in. in diameter; furnished with a cilium at each end.

In various infusions as well as in swamp water among algæ.

According to Warming, the spiral is often elongated so that the cell appears almost straight, the diameter then becoming only .00006 to .00016 in.

Var. robustum, Warming.

Thickness .00008 to .00018 in.; height of spiral .00040 to .00080 in.; diameter .00004 to .00012 in.; mostly one and a half turns; sometimes two cilia at one end.

In sea water.

S. sanguineum, Cohn.

Synonym: *Ophidomas sanguinea*, Ehrb (Monatsber, d. Berl. Akad. 1840, p. 201).

Cells cylindrical, only rarely tapering at the end, .00012 in. and more thick, of various lengths, with mostly two, seldom only one-half or two and a half spiral turns; distance of the latter .00036 to .00048 in.; diameter two-thirds as great; furnished at each end with a cilium. Cell-contents colored by numerous reddish granules with many granules of sulphur.

In foul brackish water.

According to Warming the longest specimens reach a length of .00260 in., the distance of the turns of the spiral .00060 to .00150 in., diameter one-half to two-thirds, or with the smallest one-fourteenth to one-seventh as much.

S. violaceum, Warming.

Cells either crescent-form (without a complete spiral winding) or with one or one and a fourth spiral turns; abruptly rounded at the ends and furnished with a cilium. Cell-contents violet, containing little granules of sulphur. Distance of the turns of the spiral .00030 to .00040 in., diameter .00004 to .00006 in., thickness of the cell .00012 to .00016 in.

In brackish water.

S. Rosenbergii, Warming.

With one or one and a half turns of the spiral, cells .00016 to .00050 long, .00006 to .00010 in. thick; colorless, but with numerous, highly refractive, sulphur granules. Distance of a turn of the spiral .00024 to .00030 in., diameter very different, highest half as much. Active and moving in various ways, but without cilia as it appears.

In brackish water.

S. attenuatum, Warming.

Cells tapering to the ends, usually with three spiral turns, the middle one is .00044 in. high and .00024 in. in diameter, the end ones .00040 in. high, and .00080 in. in diameter; thickness of the cell .00005 to .00008 in.

In sea water.

S. jenense, Winter.

Synonym: *Ophidomonas jenensis,* Ehrb (Infs. p. 44).

Cells obtuse at both ends, furnished with a cilium, olive-brown, .00160 in. long, .000132 in. thick, with one-half to two and a half spiral turns.

Whether this is really a distinct species is hard to say so long as it is not again found in the original locality. Possibly it is identical with *Spirillum volutans.*

APPENDIX.

We connect with the *Schizomycetes* some genera which are united with them on the part of others without question; but which show so many peculiarities that I may provisionally separate them.

SPHÆROTILUS, KUTZING.

(Linnæa VIII, 1833, p. 385, T. IX.)

Cells roundish, angular, or oblong, rounded on the angles, in the greater number united end to end in a colorless, slimy sheath, into long filaments which form cue-like, interlaced and entangled floating flocks. Multiplying by isolating vegetative cells which produce, through continued division, new filaments; propagation by spores, which form within the vegetative cells.

S. natans, Kützing, (l. c.; also 54 Jahresb. d. Schles. Ges. f. vaterl, Cultur. 1876, p. 133.)

Flocks in the vegetative stage, in the old parts yellowish-brown, in the younger colorless, much branched, very slippery. In those producing spores, a part milk-white and a part colored red. Cells .00016 to .00036 in. long, .00012 in. thick.

The flocks consist of an enormous mass of long, variously collected threads, which are formed of cells in rows, surrounded by a slimy, refractive sheath. These threads often form shrubby, branchy structures, which become attached to aquatic plants, or float in a thin stratum on the water. In the thread-cells forming spores the protoplasm separates in numerous small, highly refractive portions, which become the globular spores colored; when ripe, red; later, brown. These become free when the membrane of the mother cell dissolves. They germinate very soon and grow into threads, which are either isolate or attached to the mother or other threads. These daughter threads, formed from the germinating spore, are at first undivided, and only later become the typical row of cells. Sometimes the spores develop into threads inside the mother cell.

CRENOTHRIX, COHN.

(Beitr z. Biol, I, Bd. 12, Heft, p. 130).

Filaments cylindrical, slightly club-form, thickened above, jointed, furnished with a sheath; multiplying by the escape of the joint-like cells from the sheath and their growth into filaments. Propagation by spores, which are formed within the sheath by the further division of the cells. The spores either grow directly into threads, or form, by continued division, gelatinous colonies of round cells, which afterward produce threads.

C. Kuhniana, Zopf.

Synonyms: *Leptothrix Kuhniana,* Rabh. (Algen Sachsens, No. 284;) *Hypheothrix Kuhniana,* Rabh. (Flora Europ. Alg. II, p. 88); *Crenothrix polyspora,* Cohn, Beitr. z. Biol. I, Bd. 12, Heft, p. 131); *? Palmellina floculosa,* Radlkofer. (Zeitschrift f. Biol. Bd. I).
Exsiccata: Rabenhorst's Algen, 284.

Filaments in whitish or brownish webs (Räschen), .00003 to .00020 in. thick, widened near the ends to .00024 to .00036 in.; joints of very different lengths. Spores .00004 to .00024 in. in diameter.

In springs and drainage tile, etc.

Often a very troublesome fungus since it pollutes the water and stops up small pipes. The cylindrical filaments slightly thickened towards the end are evidently articulated; the joints after a while separate from each other, but are then inclosed by a sheath, which, originally colorless, becomes yellow or yellowish brown by imbibing iron. The sheath, at first closed, is finally burst by the continued division of the joints and these escape. Each joint can develop into a new filament. But in other cases the thread remains enclosed in the sheath; its joints are divided by numerous close cross-partitions into thin disks, which then by vertical divisions separate into little globular cells; these may be considered as the spores of the fungus. They often develop inside the sheath

nto new filaments which grow through the swelling gelatinous sheath; or they leave the sheath in order to further develop outside. They either grow in filaments or form by repeated bi-partition little colonies of rounded cells, which are held together by the membranes, now become gelatinous. These colonies are assigned to the *Palmellæ* (perhaps *Palmellina flocculosa*, Rad.); each of their cells can again form a filament.

SACCHAROMYCETES.

Saccharomycetes, or yeast fungi, are one-celled plants which multiply by budding and propagate themselves by spores produced within the cells. They live isolated or joined in sprouting chains (sprossverbänden), chiefly in liquids containing sugar in which they induce alcoholic fermentation.

In most *Saccharomycetes* the cells are globular, oval or elliptical, only rarely do they elongate into cylindrical tubes, which become jointed by transverse partitions, and may then be considered the earliest imitation of hyphæ or mycelium formation. For the purpose of multiplication the cell pushes out a little rounded protuberance (Austülpung) which becomes filled with a part of the contents of the mother cell, whose form and size it gradually acquires, and is cut off by a partition wall. Both cells can, in like manner, produce daughter cells, which frequently remain attached for a time and after their separation continue to vegetate independently.

A damp solid substance is especially favorable for the formation of spores. Typically the whole cell contents divides into two to four rounded portions, or contracts into a single globular body. Each of these surrounds itself with a cell-wall, and thus becomes a spore which can bud like the vegetative cells.

To the yeast fungi (in the narrower sense) belongs the ability to decompose the sugar of a solution, for example of wine must, into alcohol and carbonic acid, that is, to set up alcoholic fermentation. The carbonic acid escapes in rapid streams, while the alcohol, as well as some subordinate elements of sugar, e. g. succinic acid, remains behind. The fermentation proceeds with special energy with a small supply of air; but by long continued exclusion of air the yeast cells perish.

The validity of the *Saccharomycetes* species from a botanical standpoint, is similar to that of the *Schizomycetes*. As with the latter, it is also necessary here to make a limitation to the leading species, and to leave out of consideration only those species established by reliable investigators. Even then there remains much doubt, for the majority of accepted species at present are probably only different forms of one and the same kind, which have become differentiated under changed conditions of growth.

SACCHAROMYCES, Meyen.

One-celled fungi with vegetative multiplication by budding; propagation by spores which (usually) form by the division of the contents of the mother cell.

[This is the only genus, hence has the general characteristics of the group. The relation to the *Schizomycetes* is certainly quite close and apparently nearer than usually supposed by excellent authorities. The so-called budding is, after all, only a peculiar mode of self-division by elongation and the formation of transverse partitions, and the production of spores is entirely similar in the one to the other, while the physiological processes and effects are not more distinct than the existing difference in these respects between true species of *Schizomycetes*. For these reasons, as well as the fact that the two kinds of organisms are very commonly associated in nature, I have appended this account of the *Saccharomyces* without intending to imply that the species belong among the *bacteria*.]

S. cerevisiæ, Meyen.

Synonyms: *Torula crevisiæ*, Turpin (Compt. Rend. VIII, 1838, p. 379); *Cryptococcus fermentum*, Ktz. (Species Algarum, p. 146); *Hormiscium cerevisiæ*, Bail, (Flora, 1857, p. 417.)

Exsiccata: Rabenhorst's Algen, 121; Fungi Europ., 1999; Thümen Mycotheca Universalis, 800; Kryptogamen Badens, 141.

Cells mostly globular or oval, .00032 to .00036 in. long; isolated or joined in little colonies; spore-forming cells isolated, .00044 to .00058 in. long; spores usually three or four in a mother cell, .00016 to .00020 in. in diameter.

In beer, in both the surface and bottom fermentation.

This peculiar beer yeast is found in the various kinds of beer, in both kinds of fermentation. It is cultivated in quantity and furnishes then the so-called compressed yeast—a mass consisting of yeast cells and water.

S. ellipsoideus, Reess, (Bot. Unters, üb. d. Alkoholgährungpilze, p. 82.)

Exsiccata: Rabenhorst's Fungi Europ. 2000.

Cells elliptical, usually .00024 in. long; isolated, or united in little branched colonies. Spore-forming cells mostly isolated; spores in the mother cell two to four, .00012 to .00014 in. in diameter.

In wine must, spontaneously fermenting.

S. conglomeratus, Reess, (l. c. p. 82).

Cells almost globular, .00020 to .00024 in. in diameter, united in skeins which consist of numerous budding cells from one or a few mother cells; spore-forming cells often to one or two vegetative cells united; spores two to four in a mother cell.

In wine must at the beginning of the fermentation and on decaying grapes.

S. exiguus, Reess, (l. c. p. 83).

Cells conical or top-form .00020 in. long, .00010 in. wide, united in little branched colonies; spore forming cells isolated with always two to three spores in a row.

Among the yeast of the secondary fermentation of beer.

S. Pastorianus, Reess. (l. c. p. 83.)

Exsiccata: Thümen Fungi Austriaca 1099 (var. Rubi-Idåi,) und 1199 (var. Ribis).

Cells roundish-oval or elongate-clavate, of various dimensions; colonies branched, consisting of primarily club-shaped joints .00072 to .00088 in. long, which form secondary roundish or oval, angular cells .00020 to .00024 in. long. Spore-forming cells roundish or oval; spores two to four .00008 in. in diameter.

In the yeast of the secondary fermentation of wine, ciders and self-fermenting beer.

S. apiculatus, Reess, (l. c. p. 84.)

Exsiccata: Thümen Fungi Austriaca, 263.

Cells lemon-shaped, with a little short point at each end; .00024 to .00032 in. long, .00008 to .00012 in. wide, sometimes a little longer; daughter cells only from the ends of the mother cell, usually soon isolated, rarely joined in little scarcely branched colonies. Spores not known.

In the principal fermentation of wine and other spontaneous fermentations.

S. Sphæricus. Saccardo (Michelia I, p. 89, et Fungi Ital. Autogr. del. No. 76.)

Exsiccata: Thümen Mycotheca Universalis, 900.

Cells of different forms; the basal one (of a colony) oblong or cylindrical, .00040 to .00060 in. long, .00020 in. wide; the rest globular, .00020 to .00024 in. in diameter, united in crooked, branched, often skein-like families; spore formation not known.

In the fermenting juice of *Lycopersicum esculentum* (Tomato.)

S. glutinus, Cohn (l. c. p. 187.)

Synonym: *Cryptococcus glutinus*, Fresenius, (Beitr. z. Mycol. 2 Heft. p 77.)

Cells globular, oval, oblong, elliptical or short cylindrical, .00020 to .00044 in. long, .00010 wide, isolated, or two, rarely more, united; cell wall and contents in a fresh condition, colorless, after drying and again moistened a slightly reddish nucleus in the middle; spore formation unknown.

On starch paste, slices of potato, etc., forming rose-red slimy spots which at the beginning have a diameter of .02 to .04 in., but gradually spreading and uniting they cover a surface of more than .4 in. square. The coloring matter is not changed by acids or alkalies.

S. Mycoderma, Reess (l. c. p. 83).

Synonyms: *Mycoderma cerevisiæ* and *M. vini*, Demaz. (Ann. Scienc. Natur. I Série, Tome x, p. 59 et 65). *Hormiscium vini* and *cerevisiæ*, Bonord. (Handbuch p. 33, T. I, fig. 1 und 2.

Exsiccata: Thümen Fungi Austr. 1299, 1300.

Cells oval, elliptical or cylindrical, .00024 to .00028 in. long, .00008 to .00012 in. wide, united in richly branched colonies. Frequently the cells are elongated, mycelium-like; spore-forming cells reaching a length of .00080 in.; spores one to four in each mother cell.

On fermented liquids, sauer-kraut, juices of fruits, etc. On wine and beer, forming the so-called mold.

This and the following species reach in their development the highest rank in the *Saccharomycetes*. The cells often form especially in aqueous solutions elongated tubes, which become articulated by the growth of cross partitions and from these separate into single cells. The latter bud on their part in a similar manner.

While the proper yeast fungus vegetates submerged, in the upper strata of liquids and here sets up very active alcoholic fermentation, the mold fungus grows on the surface without exciting fermentation. Artificially forced to grow submerged there is a small quantity of alcohol formed, but the fungus soon perishes.

Although the growth of the mold-layer goes hand in hand with the souring of wine and beer, yet this *Saccharomyces* is not the cause of the latter phenomenon. Several other fungi whose systematic position is not certain, produce this vinegar out of the alcohol of wine, etc. According to some it is a *Vibrio* (*spirillum*) species which excites this decomposition.

S. Albicans, Reess (Sitzungsber der physic, Med. Soc. Erlangen, 9 Juli, 1877).

Synonym: Oidium albicans, Robin (Hist. Nat. d. Veget, Paras. p. 488, Pl. I, Fig. 3 to 7).

Cells in part globular, in part oval, or elongated to cylindrical, .00014 to .00020 in. wide, the globular ones .00016 in. in diameter, the cylindrical ones ten to twenty times as long as thick. Budding colonies usually consisting of rows of cylindrical cells, from the ends of which rows of oval or globular cells are produced by budding. Spores single, formed in roundish joints.

On the mucous membrane of the mouth, especially of nursing infants, producing the disease known as Thrush ("Soor"). Also in animals.

This fungus appears in the form of less or greater grayish-white masses which, however, do not consist entirely of Saccharomyces, but also contain *Schizomycetes* and the mycelium of mold fungi. When cultivated the fungus forms abundant long-jointed, richly branched threads; at the upper end of each joint is usually found a crown or tuft of short cells which have an oval or globular form and these bud again in their turn. In other cases all the cells of a colony remain short and take the globular form. The fungus excites alcoholic fermentation only in a slight degree. According to Grawitz (Virchow's Archiv. f. pathol. Anat. und Physiol. 70 Bd. p. 557), *Saccharomyces albicans* is identical with *S. mycoderma*.

S. guttulatus, Winter. (Doubtful species.)

Synonym: *Cryptococcus guttulatus*, Robin (l. c. p. 327, Pl. IV, Fig. 2,)

Cells elliptical or elongated oval, .00060 to .00096 in. long, .00020 to .00032 in. wide; brown, opaque, with two to four colorless vacuoles, isolated or two to five united. Spore-formation unknown.

In the æsophagus and intestines of mammals, birds and reptiles.

TRANSACTIONS

OF THE

BOARD OF TRUSTEES.

TRANSACTIONS OF THE BOARD.

BOARD MEETING, DECEMBER 14TH, 1880.

The Board met at 3 P. M., in the University parlor.

Present—Messrs. Cobb, Gardner, Mason, McLean, Willard and Scott.

Absent—Governor Cullom, Messrs. Bird and Fountain.

The minutes of last meeting were read and approved.

Regent S. H. Peabody read the following report, which was received:

To the Trustees of the Illinois Industrial University:

GENTLEMEN: The term now drawing to a close is notable for continuous and efficient work from all the members of the University. With as few exceptions as can ever be expected among so many persons, the students have maintained good order, as of their own choice, and have shown a hearty desire to support and to enjoy wholesome regulations.

The number of students enrolled has been: Males, 264; females, 72; total, 336.

The proportion of former students, who returned at the opening of the present year, was greater in every class but one, and greater in the aggregate than for the preceding year. The greatest deficiency has been in the preparatory class.

Thirty students are admitted upon their diplomas from accredited schools,—a larger number than for any previous year. Twenty-one high schools are now on our accredited list, and the number might be yet enlarged. Care is needed that no schools hold this relation to the University but such as may be relied upon for thorough training of pupils; that condition secured, such connection might well be maintained with a school in every county. Applications are now pending which require examinations; the expense of visitation, though usually small, should not be borne by the visiting officer, and sometimes prevents the applications which a school might otherwise make. A limited sum of money might be profitably expended in extending this connection.

Report of classes taught during the Fall Term, 1880:

Subjects.	Classes.	Men.	Women.	Total.
Mental Science	1	33	10	43
Botany	1	9	4	13
Chemistry	3	143	13	156
Geology	1	17	.....	17
Physical Geography	1	13	.....	13
Mineralogy	1	15	1	16
Physiology	4	68	26	94
Veterinary Science	2	10	.....	10
Mathematics	1	33	.....	33
	5	99	29	128
Mechanical Science	3	25	.....	25
Architecture	3	7	.....	7
Civil Engineering	3	30	.....	30
Agriculture	2	17	.....	17
History	2	31	16	47
Latin	3	17	22	39
French	2	49	20	69
German	3	75	36	111
English	3	43	38	81
Anglo-Saxon	1	14	8	22
Greek	3	9	3	12
Military Science	2	23	.....	23
F. H. Drawing and Painting	3	9	17	26
Music	3	2	6	8
Mathematical Drawing	2	49	1	50
Book-Keeping	1	40	8	48

THE SCHOOL OF DOMESTIC SCIENCE.

This subject, referred by you to the Regent and Faculty at your last meeting, was carefully considered by them. Their report was transmitted to the Executive Committee, as you directed. Seven former students and two new ones appeared in this term who might have been counted as members of this school; all of them have been fully occupied with other subjects, in the absence of instruction in that specialty. Instruction in Calisthenics has been continued during the term under the satisfactory leadership of Mrs. M. S. Scovell, a graduate of the University, who has also discharged some of the duties of a Preceptress.

ACCOMMODATION OF STUDENTS.

The uninhabitable condition of the large Dormitory, requiring those formerly housed within i s walls to seek accommodation elsewhere, caused some anxiety lest students might find it difficult to secure suitable lodgings. Notice was published asking the citizens of Urbana and Champaign to inform the Business Agent of their willingness to take students into their houses, and a very general response was made. After the term was fairly opened it appeared that only about one-fourth of the rooms offered had been occupied. Two cottages, owned by the University, were refitted, and the rooms in them were offered at low rates; most of them were taken, and yet there have always been one or more vacant. The number of houses open to students in the immediate vicinity of the University has been somewhat increased. It is believed that fair accommodation, as much as may be required, may always be found. The demand will bring forth an adequate supply. If these views are correct, large public dormitories are not necessary to our success. Such buildings have always conditions of evil which seem to me greatly to over-balance any compensating good. It is true that the lodgings which students find are not always all that could be desired, yet they are homes; students are scattered; certain safeguards are about them, and restraints upon them which can be found only in private families.

As to the disposition to be made of the Dormitory building, I shall not presume to advise farther then to remind you that in its present condition it is a constant menace, and that some mischievous or malicious person may save you the trouble of farther debate.

THE AGRICULTURAL DEPARTMENT.

I transmit to you the annual and final report of Mr. E. L. Lawrence, the retiring head-farmer, with the accompanying documents. Mr. Lawrence's administration of the farm appears to have been eminently successful financially and worthy of generous acknowledgment.

I respectfully suggest that as Prof. Morrow is expected to occupy the farm-house, a definite arrangement in detail be made with him as to the terms of the occupancy and of the use which he may be expected to make of the proceeds of the farm. I know that Prof. Morrow particularly desires that such a definite understanding should be had.

Prof. Morrow asks that authority be given for holding the usual Agricultural Institute at the University, in the last part of January; that a sum not exceeding $100 may be used to pay expenses of advertising the meeting, and expenses of persons invited to assist; that young men, farmers and others interested, may be permitted to attend, during January, the lectures of the College of Agriculture, and to use the Library, without examination or fee.

He asks that authority may be given him, with the concurrence of the Regent and the Farm Committee, to employ a suitable man as foreman of the farm, and that an appropriation be made for his payment. A foreman will be needed before the next meeting of the Board.

He renews the suggestion that a laborer's cottage should be built in the vicinity of the farm-house, at an early date. Some repairs are needed on the farm-house itself.

Some fifty cows, pure and grade Short-horns and Jerseys, are now on the farm, some of which will be in milk before your next meeting. Prof. Morrow believes that he could render good service, pecuniarily and experimentally, if permitted to engage in butter making. The Professor is known in the dairying circles of this State and Wisconsin as a person of information and authority on this subject, and the suggestion is worthy of serious consideration.

In all the above requests of Prof. Morrow, I concur.

Mr. Lawrence presents an account for extra services during the year 1874. Being entirely ignorant of the facts, I submit it to you without comment.

The Agricultural and Chemical departments have conducted a series of experiments upon the growth of sorghum and the extraction of sugar, which have been crowned with notable success, and they must result in great benefit to this industry, and reflect credit upon the University. The account of this work was received with satisfaction by a recent convention of sugar-growers and makers at Springfield, by whom steps will be taken for extending and perfecting scientific knowledge on this subject. The success already achieved here, leads the convention to designate this as the place at which they wish farther work to be done.

Prof. Burrill's report on the condition of the Horticultural Department, is transmitted. I concur in its recommendations.

THE EXHIBIT AT SPRINGFIELD.

I report satisfactory progress in the preparation of the exhibition of the practical work of the University to be placed in the State House in Springfield, for the inspection of the public, and particularly of the coming Legislature. Col. Harlow, the Secretary of State, has very kindly assigned for the purpose, the room known as the Art Gallery, on the main floor, between the chambers of the Senate and the House of Representatives.

Three large cases are ready for transportation, in which will be shown a full representation of students' work in the Schools of Agriculture, Horticulture, Chemistry, Natural History, Engineering, and Art and Design, and the walls of the spacious room will be covered with drawings. It is intended that everything in the room shall be the work of students of the University.

I recommend that authority be given to use $200 in addition to that already appropriated for this purpose.

The School of Art and Design is prospering under the care of Prof. Roos. The fees charged to students after the first term of free-hand drawing, amount to a tariff almost prohibitory, only one student having paid a fee for instruction in drawing in the present term. I recommend that no fee be charged hereafter in this School except to special students and to students in painting.

Prof. Roos asks for about 30 feet in length of additional black wall space, which should be furnished.

I transmit to you a communication from Lieut. Wood, Prof. of Military Science. I concur as to its requests, except as to the requiring of the Juniors to drill, which should receive careful consideration and might be reported on at the next meeting of the Board.

I recommend that Mr. C. G. Armstrong be employed for three months as taxidermist at twelve dollars per month, under the direction of Prof. Taft.

Pursuant to your request a station of the U. S. Signal Corps has been located at the University, and Sergeant S. A. Welsh has reported for duty here.

A room has been arranged in the third story of the main building, and access given to the roof. The University provides quarters, fuel, and light. Instruments are provided and placed at the expense of the Government, and current expenses other than those mentioned are paid by the same authority. The Signal Office expects the University to put the station in communication with the telegraph lines, and I made application to the manager of the Western Union Telegraph Company for permission to run a wire into the office of that company at Champaign. Permission was granted, the work to be done at the expense of the University, but it was coupled with a refusal to take the business, unless brought to the office, in writing, which is impracticable.

The station is thus isolated from the government system, and is, at present, of very little use to anybody. Meanwhile, since the 10th of October, the officer at the station has taken his observations and reported them by mail to the office at Washington.

The students' government is in good hands and has been working satisfactorily since the opening of this year. A few cases, appealed to the Faculty, have been heard by them, *de novo*. They used neither the evidence nor the conclusions of the court, but in their own way arrived at judgments and took action, which, by its tenor, fully sustained the previous judgments of the student's court. The necessary expenses of this government have been paid from the fines collected. The existing status of affairs makes this an uncertain way of collecting the revenue needed, and there is now a small deficit against the government. I would suggest that authority be given to the Business Agent to audit the accounts of the student's government, and to pay any deficit that his judgment may approve, to the amount of, say $25, for any college year, beginning with the last year.

The list of appropriations to be asked of the Legislature at its next session, will be reported to you by the Executive Committee. Aside from the usual items which have hitherto been granted, the most important request will be for a sum needed to sustain the teaching force of the University. The constant shrinking of the income from the endowment fund, every dollar of the fund itself remaining intact, has come from the constantly lowering rate of interest,—partly caused by the restrictions which the legislature, in its caution, has thrown about the investments—but mainly by the financial condition of the country. If I understand rightly, the present income from this source is from $10,000 to $12,000 per annum less than in the first years after the organization of the institution. The loss has been gradual but constant for several years, and the trustees have striven by various devices to meet the shrinking, and avoid debt, as required by law. To this end they have curtailed expenses by lopping off departments; by reducing the salaries of professors, and the wages of employés; and by raising the fees charged to students for incidental expenses. By these means the University has been weakened, its efficiency impaired, some of its best instructors lost, while those who remain are burdened with an amount of duty too great in quantity to be of the best quality. The great and rich State of Illinois, having accepted this important trust from the General Government, ought so to administer and sustain it, as to give it the widest usefulness in fulfilling the purposes for which it was founded. The friends of the University may point to the results constantly achieved here, as shown in all departments, and as will appear in the exhibition soon to be placed in the State house at Springfield, and may conscientiously and emphatically affirm that no other institution resting on the munificent provisions of the act of Congress of 1862, more exactly or more faithfully complies with the mandates of that act. "Such things ye shall do, and such other things ye may not neglect." To continue thus obedient the University needs aid, and confidently turns for it to its founder, the State.

An item needing attention is the completion of our system of warming and ventilation. The work done last year has proved successful, and its continuation this term in the library satisfies fully our expectations. Funds are needed to complete the ventilation of the remaining class-rooms, and of the chapel. Plans and estimates for this purpose have been prepared, and will be laid before you.

The east boiler under the main building should be replaced by one of more power and better construction. This opportunity should be taken to collect the heating boilers from the main and chemical buildings in a suitable boiler-house in the rear of the main building. Fires will be removed from the buildings with their accompanying dust and smoke; danger of fire will be lessened; the firing of both buildings can be done at one place, and competent service will be utliized; steam can be used for one or both buildings, as desired, and a boiler can be kept in reserve against accident, or for extreme cold weather, as may be necessary. The matter has been carefully considered, plans drawn, and estimates made, which will be laid before you.

Prof. Baker asks that the needs of his department may be considered. Several years ago an appropriation was made for a high grade instrument for geodetic work, but for some unknown reason the instrument was not ordered, and the appropriation lapsed. An altitude and azimuth instrument is now asked for, at a cost of $1,000, and $200 for needed repairs to the observatory. The students of this University have always been favorites with the officers of the Lake and River Surveys conducted by the Government. Anything which will give them more complete training will be usefully applied.

Respectfully submitted,

S. H. PEABODY, *Regent, pro tempore.*

COLLEGE OF AGRICULTURE,
CHAMPAIGN, ILL., December 10, 1880.

Dr. S. H. Peabody, Regent:

SIR: During the present term I have taught classes in elements of Agriculture, and Agricultural Engineering and Architecture; the classes number 12 and 6. Nearly all the members of each class have made gratifying progress, and manifested much interest in their work.

The experience of this term confirms my conviction that good results come from the offer of the One Year Farmer's Course.

For three years past our Agricultural Institute has been held during the latter part of January. Good results have been manifest. I would respectfully ask that authority be given for holding one during next month, and for the expenditure of such money, not exceeding $100, as may be necessary to give proper notice of the Institute, and to pay expenses of persons who may be invited to assist in its work.

I would also ask that authority be given to make announcement, as was done last year, that young farmers or others interested may attend the Agricultural, Horticultural and Veterinary Lectures, and make use of the library during the three weeks of next term which precede the Institute without examination or payment of any fees.

A considerable number of experiments have been tried; others are in progress or being prepared for.

The work in Sugar-making from Sorghum in which Profs. Weber and Scovell have heartily interested themselves and to which they have given much time, has been as successful as could have been expected. The results as reported by Prof. Scovell to the Convention of those interested in this industry, just held at Springfield, awakened much interest, and resolutions of appreciation and calling on the Legislature for an appropriation for this specific work at the University were heartily adopted.

Mr. Lawrence having the understanding that the term of his active services closed at the first of this month, I have given such directions as seemed necessary about the work on the farms. The experienced farm laborers now on the farms will be able to do all that is needed during the winter months.

I would recommend, however, that authority be given for the employment of a working Foreman, with the concurrence of yourself and the Farm Committee, as it may be desirable to have one at work before the next meeting of the Board. Especially for assistance in experimental work, it would be desirable to secure some one who has had instruction in the department.

Some repairs are needed on and about the farm buildings, but they probably can best be decided upon by the Farm Committee.

I would again respectfully suggest the importance of the erection of a laborers cottage on the Experimental Farm at an early date.

During the coming year the farms will have a stock of near fifty cows—pure and grade Short-Horns and Jerseys. Quite a number of them will be in milk before the next meeting of the Board.

I have no doubt the profits of the farms could be increased, as well as opportunity given for some valuable and timely experiments, if I could be authorized to engage in butter-making.

The work of the farms during the year will be reported to you by Mr. Lawrence, Head Farmer.

Respectfully submitted,
G. E. MORROW, *Professor of Agriculture.*

E. L. Lawrence, Head Farmer, presented his tenth annual report, accompanied by detailed statements of expenses, receipts, cost of experimental work, etc., also inventories of the salable property, and of teams and tools.

The report stated the crops of the farms, exclusive of the "Griggs Farm" and land occupied by experimental and horticultural crops, as follows: Corn, 117 acres, yielding from 40 to 60 bushels per acre, averaging 55 bushels; wheat, 17 acres, yielding from 17 to 26 bushels; oats, 21 acres, the crop lodging so badly that it was harvested mainly for the straw; meadow, 95 acres; pasture, 220 acres. Of the "Griggs Farm," 80 acres were rented at $3 per acre, and 80 acres for one-half the hay in the stack. A detailed explanation of the reasons for the mode of management adopted, was given, with an expression of gratification at the profits made, and the increase of property on the farms. The report closed with special commendation of A. J. and W. H. Stoneburner, farm laborers, for their "honesty, efficiency, and steady purpose to work for the interest of the farms."

The balance sheet accompanying the report was as follows:

BALANCE SHEET OF ILLINOIS INDUSTRIAL UNIVERSITY FARMS—
December, 1880.

By cash sales and credits	$7,533 29	
By permanent improvement	204 50	
By Inventory by valuation of Committee, salable property	9,128 79	
By Inventory by valuation of Committee, teams and tools	2,500 00	
To expenses of the year		$5,657 05
To Inventory December, 1879, salable property		10,459 24
To Inventory December, 1879, teams and tools		2,135 00
To balance		1,473 29
	$19,724 58	$19,724 58

E. L. Lawrence, Head Farmer, presented a claim for $300 in payment for services rendered to Horticultural Department in the year 1874, with detailed statement of the circumstances.

The Board proceeded to consider the recommendations of the report.

Fifty dollars were appropriated for expenses of visiting schools.

The Farm Committee was instructed to take accurate inventory of farm stock and property.

On recommendation of the Regent an amount of $100 was appropriated for Farmers' Institute.

It was moved and carried that a committee of three be appointed by the Chair to draw up resolutions acknowledging the faithful services of the Head Farmer, Lawrence. The Chairman so appointed Messrs. McLean, Scott and Gardner.

A committee of three (Messrs. Scott, Millard and McLean) were appointed to consider and report forthwith plans for the carrying on of the University Farms by the Professor of Agriculture.

The requests of Professor Morrow in regard to laborers' cottage and the starting of a dairy were referred to the same committee.

The request of Mr. E. S. Lawrence in regard to extra services was, on motion of Mr. Millard, laid on the table.

The following appropriations were made for the Horticultural Department: Pots for Greenhouse, $25; boiler tube cleaner, $3.50; seeds and plants, $15. The Regent was authorized to use an additional $200 for the exhibition at Springfield.

On motion of Mr. Millard, a report from Lieutenant Wood was referred to a committee of the Faculty and Board, consisting of the Regent, Prof. Snyder, Lieut. Wood and Mr. Gardner, to report at the next meeting of the Board on the reorganization of the course in Military Science and Drill.

Mr. J. E. Armstrong was employed as Taxidermist for three months at $12 per month.

It was resolved that the Business Regent be and is hereby authorized to audit the accounts of the Students' Government, when they are presented to him by its officers' and to pay at his discretion any deficit which he may find therein, to amount not exceeding twenty-five dollars for any collegiate year, beginning with the year ending June, 1880.

Recess taken until 9 o'clock, P. M.

EVENING SESSION.

The Board met on time. Present as before.

The Treasurer's Report was presented, received and ordered on file.

ILLINOIS INDUSTRIAL UNIVERSITY

To JNO. W. BUNN, TREASURER.

	CR.		
1880.			
Sept. 14	By balance		$12,712 48
30	" amount received on account of fees	$2,902 00	
	" amount received on account of tuition in Preparatory department	790 00	
	" amount received on account of fuel and lights	32 50	
	" amount received on account of Mechanical department	4 23	
			$3,728 73
Oct. 1	" interest on Sangamon county bonds		750 00
	" interest on Douglas county School bonds		400 00
12	" amount received on account of Agricultural department	3,570 14	
Nov. 30	" amount received on account of Horticultural departm't	77 04	
	" amount received on account of Architectural deparm't	942 40	
	" amount received on account of Mechanical department	337 71	
	" amount received on account of Chemical department	400 00	
	" amount received on account of fuel and light	31 22	
	" amount received on account of buildings and grounds	80 49	
	" amount received on account of Library and apparatus	1 50	
	" amount received on account of fees	507 25	
	" amount received on account of I. C. R. R. donation	675 10	
			6,621 85
			$24,213 06
	DR.		
1880,			
Nov. 30	For Board expense	$371 20	
	" amount paid for salaries	6,411 78	
	" amount paid buildings and grounds	57 00	
	" amount paid for fuel and lights	1,115 04	
	" amount paid for stationery and printing	182 91	
	" amount paid for furniture and fixtures	34 24	
	" amount paid for Mechanical department	384 33	
	" amount paid for Architectural department	765 13	
	" amount paid for Agricultural department	1,354 39	
	" amount paid for Horticultural department	160 73	
	" amount paid for Chemical department	844 93	
	" amount paid for Military department	16 24	
	" amount paid for Library and apparatus	37 92	
	" amount paid for incidental expenses	40 65	
			$11,776 49
	" amount paid for Physical Laboratory	$3 35	
	" amount paid for cabinets	18 20	
	" amount paid for Chicago Exposition	5 45	
	" amount paid for models for civil engineering	15 75	
	" amount paid for preparatory department	645 00	
	" amount paid for State House exhibit	16 87	
			704 62
	State Appropriations—		
	" amount paid for Ventilation, and water closets	$383 14	
	" amount paid for Cabinet cases	529 70	
	" amount paid for Books and publications	366 04	
	" amount paid for Buildings and grounds	583 78	
	" amount paid for Mechanical and Architect shops	438 64	
	" amount paid for Cabinets	44 32	
	" amount paid for Chemical and Physical Laboratory	42 45	
			2,388 07
	For balance		9,343 88
			$24,213 06

URBANA, December 14, 1880.

JOHN W. BUNN, *Treasurer.*

The Business Agent then read his report, which was also accepted and ordered on file.

Statement of Current Appropriations and Receipts, Nov. 30, 1880.

	Applied.	Received.	Expended	Balance.
Board expense	$371 20	.....	$300 00	$71 20
Salaries	15,200 00	.....	6,411 78	8,788 22
Fuel and lights	2,500 00	$63 72	1,115 04	1,448 68
Stationery and printing	300 00	.....	182 41	117 59
Buildings and grounds	100 00	80 49	57 00	123 49
Incidental expense	200 00	.....	40 65	159 35
Fixtures and furniture	100 00	.....	34 24	65 76
Library and apparatus	50 00	1 50	37 92	13 58
Mechanical department, balance	176 68	341 94	384 33	134 29
Architectural " "	419 27	942 49	765 13	596 54
Agricultural " "	4,315 21	3,570 14	1,354 39	6,530 96
Horticultural " "	.....	76 04	160 73	84 69
Chemical " "	16 57	400 00	844 93	428 36
Military " "	50 00	.....	16 24	33 76
Sundries—Physical laboratory, balance	67 07	.....	3 35	63 72
Cabinets, balance	29 25	.....	18 20	11 05
Chicago Exposition	25 00	.....	5 45	19 55
Col. of Eng. printing	10 00	.....	.....	10 00
Models, C. E	25 00	.....	15 75	9 25
Students' fees	.....	3,409 25	.....	.....
Tuition Preparatory department	.....	790 00	645 00	145 00
I. C. R. R. freight donation	.....	695 10	.....	.....
Springfield exhibit	.....	.....	16 87	.....

Statement of State Appropriations and Receipts, Nov. 30, 1880.

	Applied.	Received.	Expended	Balance.
Taxes on lands	$4,306 02	$4,306 02	$4,306 02	.....
Buildings and grounds	5,000 00	5,000 00	5,000 00	.....
Chemical and Physical laboratories	2,000 00	2,000 00	2,000 00	.....
Mechanical and architectural shops	3,000 00	3,000 00	3,000 00	.....
Library cases	1,000 00	1,000 00	1,000 00	.....
Books and publications	3,000 00	3,000 00	3,000 00	.....
Cabinet cases	4,500 00	4,500 00	4,500 00	.....
Chemical laboratory	40,000 00	40,000 00	40,000 00	.....
Green house	2,500 00	2,500 00	2,500 00	.....
Cabinets	2,000 00	2,000 00	2,000 00	.....
	$67,306 02	$67,306 02	$67,306 02	.....
July 1, 1879.				
Taxes on lands	$5,000 00	$4,493 02	$4,493 02	.....
Buildings and grounds	5,000 00	5,000 00	4,309 72	$690 28
Chemical and Physical laboratory	2,000 00	2,000 00	738 14	1,261 86
Mechanical and architectural shops	3,000 00	3,000 00	2,301 67	698 33
Books and publications	3,000 00	3,000 00	2,215 41	784 59
Cabinets	1,000 00	1,000 00	695 52	304 48
Ventilation and W. C	2,500 00	2,500 00	2,394 95	105 05
Heating apparatus	3,000 00	3,000 00	2,997 43	2 57
	$24,500 00	$23,993 02	$20,145 86	$3,847 16

It was decided that only special students and students in painting in the School of Art and Design, should be charged special fees, as heretofore.

An auditing committee, consisting of Messrs. Gardner and Mason, having been appointed, they reported that warrants and vouchers from No. 1 to 183, both inclusive, had been examined and found correct.

Adjourned to 8:30 A. M.

SECOND DAY'S SESSION.

The Board met at 9 A. M. Present as before.

The report of Messrs. Millard and Fountain on University lands in Minnesota, and the report of Messrs. McLean and Gardner on University lands in Nebraska, were received and ordered on file:

To the Honorable, the President and Board of Trustees of Illinois Industrial University:

Your committee, the undersigned, respectfully report, that pursuant to a resolution of this Board, passed at the June meeting of 1880, they were appointed by your honorable President as a committee to examine the lands belonging to the University, and situated in the counties of Kandiyohi, Renville and Pope, in the State of Minnesota.

In pursuance of such appointment your committee visited said lands, reaching Wilmar, the county seat of Kandiyohi county, on the 30th day of August last. An examination of the tax books of this county proved that all taxes had been paid on the lands in the latter county for all past years.

Kandiyohi county is said to be one of the most fertile wheat-raising counties in the State. There is little timber in the county. The general surface is rolling prairie. The population outside the villages is largely Swede and Norwegian.

From statistics it appears that in 1879 this county had 57,940 acres of wheat, the yield being 764,161 bushels, an average of about thirteen bushels per acre. In 1880 61,566 acres were sown, and the estimated yield was about 900,000 bushels, while the oat crop of 1880 was estimated at about 450,000 bushels. Wilmar is situated on the St. Paul and Manitoba Railroad, and is a thriving village. It contains four churches, three grain elevators, an iron foundry and machine shop, public schools, two hotels, two newspapers, two banks, and many thrifty-looking stores.

The bulk of the University lands, about ten thousand acres, lie south of Wilmar ranging from twelve to twenty miles. A two days' ride over these lands, and the surrounding country, enable your committee to obtain what they deem a very accurate knowledge of their character and quality.

There is no timber on the University lands in any of the counties. The surface of the country is dotted with lakes; many of the smaller ones seem to be shallow and fast drying up. We were unable to find any stakes of former surveys, but with the aid of a guide, we rode over most of the University sections and within view of other tracts.

We found many farms scattered throughout the country. The improvements in almost every instance were primitive, but the fields large and the wheat crops, which were mostly harvested but not stacked, indicated a good fertile soil. The University lands in Kandiyohi county, for the most part lie in the most fertile portion of the county. These lands are situated in three ranges, viz: 33, 34 and 35. From our diary we extract the following: "All the land in range 33 lies south of Lake Lillian township. They are high and rolling prairie, no settlements nearer than about three miles. On the north, several fine farms lie near Lake Lillian, fenced, with large crops of wheat and oats. On one farm were several hundred sheep. The settlers are principally Norwegian."

"The lands in range 34 are of the same general surface and character as in 33. There are a large number of settlements north of the southern section line of township 117, in range 34. On section 14, in which lie 160 acres of University land, we found an excellent well of water, pure in taste and very cold; showing that water of the best quality can be obtained at a moderate depth.

"One hundred and seventy acres of land about one mile north of section 8, University land, sold but a short time before our visit, at seven dollars per acre."

The Kandiyohi county land is evidently fertile, located mostly on high and rolling prairie, with all the advantages for eventually becoming as fine farming land as can be found in Minnesota. There are few low places, little or no water that we could find. The low places produce a number of varieties of rank tall grasses, and farmers tell us that as these spots dry out, they produce the largest wheat yields, owing to the depth of the alluvial soil.

The Renville (formerly Lincoln) county lands are not so high and rolling as in Kandiyohi county, but the soil is even, deep, and equally fertile, settled with Swedes and Norwegians, but more sparsely than the former county. These lands lie about eight or ten miles from the railroad extending from Minneapolis to Big Stone Lake on the Dakota line. On section 10, town 116, range 35, is located a new school house. This entire section belongs to the University. Land sold in section 17 of this town and range in 1878 for seven dollars per acre.

Of these two counties your committee report that they found all the land belonging to the University of the best quality, little waste, and all good wheat producing soil.

The average value at the present time seems to range from six to seven dollars per acre. The prospective development, however, of these counties leads your committee to the conclusion that it would not be wise to put the lands in market for a few years to come, when, as your committee fully believe, they will realize to the University at least ten dollars per acre.

The Pope county lands, consisting of about 6,000 acres, are located from thirty to forty miles north of Wilmar and one town west, and all except one-half section, in two townships. Owing to the rough hilly country between these lands and the St. Paul and

Manitoba railroad running to the south of them, and the distance of the Northern or Glynden branch of the same road, there is at present no outlet for this section of Pope county.

Your committee were unable to make as careful a survey of these lands as of the lands in the other two counties. They were met on their ride into Pope county by a hard north-west rain and cold wind storm, which lasted several days.

Notwithstanding their unpleasant reception they were able to drive onto portions of the lands and to learn from the Town Assessor of their character and quality. These lands are situated on an almost level plateau, gently undulating, surrounded in the distance by belts of timber, and almost entirely free from low places. The lands are uniform in character and quality. Not as rich or fertile as in the other counties, but evidently well adapted to sheep grazing, and eventually will become fair farming lands.

At an interview with the officials of the St. Paul and Manitoba railroad, we learned that that enterprising company were already extending a line of their road from Minneapolis west midway between the two roads north and south of Pope county, which when built will run in close proximity to the University lands, when they will have a market value and be more sought after by settlers.

Your committee, therefore, are of the opinion that there is at present no sale for these lands and would recommend that no immediate steps be taken to place them in market.

Your committee file herewith a map of Minnesota with all the University lands marked in color. Also all papers and maps furnished them by your Secretary.

All of which is respectfully submitted,

S. M. MILLARD,
T. T. FOUNTAIN,
Committee.

To the Honorable, the President and Board of Trustees of the Illinois Industrial University:

The undersigned, your committee appointed by resolution of this Board passed at the June meeting of 1880 to examine the lands belonging to the University situated in Gage county, State of Nebraska, would respectfully submit the following report:

In pursuance of said appointment, your committee did in the month of November, 1880, visit and examine said lands, first proceeding to Beatrice, the county seat of said Gage county, and there ascertaining that the taxes on said University lands had been regularly paid and University's title in fee perfect.

We then proceeded to examine each tract of land as per list of same furnished us by this Board, and endeavored to get as correct a knowledge of the county, its advantages and country in general, as limited time and zero weather would admit of.

Beatrice is pleasantly situated on the east bank of the Big Blue River, at an elevation of fifty feet above high water; the ascent from the river is gradual and beautiful. It now has a population of three thousand. Its principal stores are first class anywhere, permanently built of stone and brick, three stories high and well filled with goods. And residences that compare favorably with those in older towns.

The business men are a live, go-ahead, wide-awake set, well calculated to make their miniature city a great one in a short time.

Gage county is very favorably situated, being in the second tier of counties from the east, and adjoining the State of Kansas on the south. The surface is generally high, gently and beautifully rolling, is well watered by the Big Blue River, which runs through the county diagonally from the north-west to the south-east, with its many tributaries. Many of them never failing, makes it one of the best watered counties in the State. There is a great amount of timber growing along the streams in the county, which seemed of good quality and different varieties, much more than an average of other counties of the State, as far as we observed. There is an abundance of building and lime stone, in different parts of the county, of a superior quality; some of the quarries are now being extensively worked and stone shipped to Lincoln and other parts of the State.

The soil is rich, black and deep and capable of producing all crops raised in the same latitude, where cultivated corn, oats and wheat seemed to be the principal crops. Your committee think the county can be classed with the best land in the State of Nebraska. Your committee are satisfied that our lands in Gage county will raise cereals of every kind usually produced in that climate. Yet we see and are convinced that the main or principal interest of Nebraska is now and will be for all time the growing of stock, mainly cattle and sheep; and while at this time there is more money invested in cattle, the day is not far distant when sheep will be the principal stock of Eastern Nebraska, and now there are many large flocks of sheep and their numbers are fast increasing.

The talk was much of sheep. We learned from many persons who have devoted many years to the sheep raising and wool-growing business, that the climate, water and soil was everything desired to make the business successful and profitable. That sheep were free from diseases known in other sections of our country and returns very satisfactory.

The price of land, while for the present largely governed by the advantage of contiguity to railroads, towns, streams and timber, yet there is a value that extends throughout the county which can be named as a minimum: to-wit, five dollars per acre, and that situated farthest from the advantages above referred to. We do not think that minimum will long exist, from the fact every improvement that is made enhances the value of such land as may be contiguous to such improvements.

Gage county is rapidly filling up with enterprising and intelligent emigrants of means, and for a newly settled county may be classed as above the average in financial ability, which is shown by the nature and extent of improvements made on their farms.

Your committee examined each tract of the lands owned by the University, and found them equal to the average of lands in the county as to quality and surroundings. Very little waste lands, and none of them so remote from towns, railroads or rivers as to materially affect their present market value, and we, without hesitation, class them as eligible, and comparatively ready sales could be effected.

There are many farms improving near and in the vicinity of the University lands, which will tend to enhance their value and make them much more salable.

The Otoe Indian Reservation, embracing two townships, lay south of these lands in Gage county, and the General Government have granted the petition of said tribe and ordered all their lands sold, after being appraised, in small quantities, to actual settlers, and it is expected said lands will sell at an average of from fifteen to twenty dollars per acre. The sale of these lands we think will be of advantage to the University lands.

For the expectant advantages and reasons given in this report we unhesitatingly recommend that for the present said lands be withheld from sale, as they are daily increasing in value. And in the near future you will be able to realize much more from their sale than if sold at the present time.

We have made plats of each tract and submit the same for greater certainty.

And your committee file herewith a map of the county of Gage, with all of the University lands marked "C," showing improvements in vicinity and how situated as to water, stone, etc. We also return herewith map and list of lands furnished us.

All of which is respectfully submitted.

D. GARDNER.
ALEX. McLEAN.

The following report was made by the Executive Committee:

To the Honorable Board of Trustees:

Your committee, to whom the Regent and Faculty were ordered to report on the School of Domestic Science, would respectfully state that the Regent and Faculty have made a detailed statement on the subject, and while as a whole we endorse the recommendations made, yet as the subject is of importance, we would respectfully ask further time for our final report.

EMORY COBB, *Chairman.*

The report was accepted and further time granted.

The following report was received, and its recommendations adopted:

To the Hon. President and Board of Trustees Illinois Industrial University:

Your committee, the undersigned, to whom was referred the subject of farm management, and the propriety of building a farm cottage and dairy-house, respectfully report that, in their opinion, it is advisable to place the farms of the University under the control and management of the Professor of Agriculture, to be conducted by him with the advice of the Regent and Farm Committee.

That he be supplied with a suitable foreman, as assistant.

Also we recommend that the question of the erection of buildings for a farm cottage or tenant house for farm help, and suitable buildings and apparatus for dairying, be referred to the Committee on Legislative Appropriations, requesting that committee to ask for an appropriation for these purposes.

We also recommend that the Professor of Agriculture be furnished, free of rent, the house now occupied by Mr. Lawrence, and that he give proper credit to the farm for produce used by him, and grown upon the farm.

JAS. R. SCOTT,
ALEX. McLEAN,
S. M. MILLARD.

Regent Dr. Peabody recommended Mr. J. C. Feitshans as instructor in elocution, and Mrs. Jennie Hollister as teacher of vocal music, and further asked authority to employ assistance in Physical laboratory to the amount of $15 per month. The recommendations were approved, and the request granted.

The leasing of the Griggs farm was referred to the Farm Committee.

Three hundred and fifty dollars was appropriated for board expense.

The following resolution was passed:

WHEREAS, The term of service of E. L. Lawrence, head farmer, has expired, and whereas he has proved himself an able and efficient officer of this institution during the term of ten years, be it

Resolved, That the thanks of this Board be, and the same are, hereby tendered to E. L. Lawrence, Esq., for the faithful and intelligent discharge of his duties as head farmer, and for his untiring efforts to make this department an honor and benefit to the Illinois Industrial University.

Resolved, That these resolutions be spread upon the records, and a copy of the same be furnished to Mr. Lawrence by the Secretary.

Mr. McLean offered the following resolution, which was adopted:

Resolved, That the matter of discontinuing the preparatory classes be taken into consideration with a view to decide as to the necessity of still continuing the preparatory course of studies for a limited period in the future, and that the matter be made a special order to be decided at the next meeting of this Board.

The following resolutions were read and passed:

Resolved, That the question of the old Dormitory and its final disposal, and as to the authority of the Board or Legislature in the premises, be referred to the committee on Buildings and Grounds, and that they report to the Executive Committee, before the meeting of the next Legislature, their conclusion, with such recommendations as may be deemed advisable.

Resolved, That the Executive Committee, as soon as the foregoing committee shall report, submit to the Legislature such proposition or recommendation regarding said Dormitory as shall be deemed for the best interests of this University.

Adjourned.

E. SNYDER,
Secretary.

EMORY COBB,
President.

BOARD MEETING, MARCH 8, 1881.

The Board met in the University parlor, at 4 o'clock P. M.

Present—Messrs. Cobb, Gardner, Fountain, Scott and Mason.

Absent—Governor Cullom, Messrs. Bird, McLean and Millard.

A telegram from Mr. McLean stated that he was detained by the heavy snow storm.

The record of the last meeting was read and approved.

The election of officers was, on motion of Mr. Scott, postponed until March 9th, 1881, at 10 o'clock A. M.

Mr. Scott made the following report as Chairman of Farm Committee, in regard to accurate inventory of the University farm. It was received and placed on file:

To the Board of Trustees of the Illinois Industrial University:

In accordance with instruction your committee has made appraisal of teams, tools, and salable property on the University farms, giving the value December 1, 1880 as nearly as possible.

The teams (10 work horses), implements and machinery have been valued at $2500. This is, approximately, a reduction of 10 per cent from the valuation made by Mr. Lawrence in his report as Head Farmer. The valuation of several items of salable property is the same as made by Mr. Lawrence. The estimates and weighings made by him in harvesting the hay and corn crops have necessarily been taken as the basis for determining quantities on hand. The principal reduction made is in the valuation of the Short Horn and Jersey cattle. For some years these cattle have not been revalued, the yearly inventory showing estimated cost, purchase price, food, care, etc., reduced by amount of sales. Your committee give the present value of this stock at $2690.

The value of all the salable property is made $9,128.79. Adding $2,500, the value of teams and tools, gives $11,628.79 as the value of all the property on the farms. The reduction from the inventory made by Mr. Lawrence is $2,599.20. The following summary gives, in general, the nature of the property. An inventory in detail accompanies this report.

SUMMARY.

Corn, 5700 bushels	$2,015 75
Hay, 145 tons	1,200 00
Straw, corn-stalks, beets, etc	470 00
Potatoes, oats and artichokes	42 50
Growing wheat and rye, 32 acres	92 50
Cattle, Short-horns 22 head	2,160 00
Cattle, Jerseys 8	530 00
Cattle, grade cattle 65	1,728 65
Swine, hogs and pigs 77 head	511 00
Colts, 4 head	280 00
Cider and barrels	73 00
Accounts, etc	25 39
	$9,128 79
Teams and implements	2,500 00
Total farm property	$11,628 79

JAS. R. SCOTT,
T. T. FOUNTAIN,
S. M. MILLARD,
Committee.

Mr. Gardner presented the following report from the committee on Organization of Military Department; it was received and its recommendations adopted.

To the Trustees of the Illinois Industrial University:

The committee to whom were referred the communications of Prof. Wood, Professor of Military Science, made at your last meeting, have considered the subject, and ask leave to report the following Regulations for the Military Department.

1. All male students of the University are required to drill except:

Those who present certificates of disability, signed by a physician who shall be duly appointed Medical Inspector for the Battalion.

Special students in Agriculture who attend for the winter term only.

Students in full standing in the Senior class.

Students excused by the Faculty on account of special service for the University.

2. Students who are required to drill must procure the uniform cap when they enter the University. They must provide the full uniform required by regulation by the beginning of their second term's residence at the University.

3. A student may be admitted to the military class, or may be assigned to official duty in the Battalion, upon the conditions following, viz:

He must have finished the studies of his course, or allowed equivalents, up to the time of such admission or assignments.

He must have at that time, and must continue to maintain, such standing in other University studies, as will permit him to take a fourth study.

He must have and must continue to maintain a good reputation as a scholar, a gentleman, and a loyal, faithful and orderly student.

Freshmen may enter the military class at the beginning of the Spring term; they may be appointed corporals.

Sophomores may be appointed sergeants, Juniors may be appointed captains and lieutenants.

4, All appointments or admissions provided for in Rule 3. shall be made by the Professor of Military Science, subject to the approval of the Faculty; and the Professor, with the consent of the Faculty, may relieve any officer of the Battalion, or may dismiss when the good of the service may require it. In an emergency students may be appointed to commands other than those specified in Rule 3.

5. A suitable number of students, not to exceed fifteen, may be assigned by the Professor of Military Science to be musicians. So long as they perform satisfactorily the duties of musicians they shall be exempt from other military duty.

6. During the Spring term the Faculty shall appoint a committee who shall examine candidates for nomination to the Governor of the State to receive commissions in the State militia. This examination shall be upon the theoretical studies pursued in the military classes, and in the practical work of the parade ground, taught at this University. Candidates for this examination must be members of the Senior class, in full standing at the time thereof; must have completed the course of military studies; must have served three terms in command in the battalion as captains or lieutenants, and must be approved by the Faculty as having good reputation as officers, scholars, and gentlemen. Those who pass the examination with a standing of 80 per cent. shall be nominated for commissions as aforesaid.

7. The conditions of Rule 6 shall apply to the students of the class of 1881, except that no more than one term of service as captain or lieutenant will be required.

The class of 1882 remain excused from drill during the remainder of the current college year.

The foregoing report is respectfully submitted.

S. H. BEABODY.
E. SNYDER,
WM. T. WOOD.
Committee.

Recess taken till 7.30 P. M.

EVENING SESSION.

The Board met on time. Present as before. The Regent read his report, which was received.

To the Trustees of the Illinois Industrial University:

I have the honor to report upon the work of the University for the second quarter of the current year, as follows:

The attendance and the interest in scholarly attainment is steadily preserved. The number of students is

	Males	Females.	Total.
For winter term	261	76	337
For the year	297	82	379

The number of classes is 57.
Their aggregate membership is 865 249 1114

A detailed statement is presented herewith.

THE SPRINGFIELD EXHIBIT.

At the end of the fall term two car loads of material, including cases and fittings, were sent to Springfield, and the articles were arranged in the Art Gallery of the State House. The spacious apartment was very effectively filled, while space was left for the accommodation of the committees of the Senate accustomed to meet in the room. The display consists wholly of students' work in the departments of Agriculture and Horticulture, Civil and Mechanical Engineering, Architecture, Chemistry, Natural History, and Art and Design.

It has attracted much attention, and has received abundant praise from State officers, the members of the Senate and Assembly, the members of the State Teacher's Association, the public press, and the public generally. A neat catalogue has been printed, which with the circular of the University is kept constantly in supply for the information of visitors. It is believed that this exhibit will prove of great value to the University, as showing to the Legislature and to the public the extent, the variety, and the excellence of the practical work done in our various departments. An appropriation will be needed to bring the material home.

APPROPRIATIONS.

In accordance with your instructions, and with the advice of the Executive Committee, a bill was prepared and presented to both branches of the Assembly, asking appropriations for the coming two years, as follows:

For taxes on lands in Minnesota and Nebraska	$2,500	per an.
For buildings and grounds	2,500	"
For books and periodicals	1,500	"
For machine shops	1,500	"
For laboratories	1,500	"
For collections in Natural History	1,000	"
For library cases	1,000	"
For current expenses of instruction	10,000	"
	$21,500	per year.
For boiler house and chimney	$5,500	
For repairs in heating and ventilation	4,000	
For cottage and dairy house	1,500	
For engineering instruments	1,000	
Total amounts for two years	$12,000	
	$55,000	

The bill has been favorably received by the committees of the House and Senate, and has a fair prospect of ultimate success.

THE AGRICULTURAL INSTITUTE

Was held, as heretofore, during the last week in January. The work was done by the instructors in the University, aided by the President of the State Board of Agriculture and the State Entomologist. The time devoted to the meetings was shorter, and the attendance less than on previous years; yet the interest was sustained and the general results satisfactory.

THE FARM.

The inclement winter has prevented any work on the farm other than the care of stock. Prof. Morrow, under the authority given by you at your last meeting, has engaged the services of Mr. T. F. Hunt as foreman of the farm, at $30 per month, to begin at the close of the present term. You are asked to confirm this appointment. For detail of work, as proposed by Prof. Morrow, and other suggestions concerning the farm, I refer you to his report herewith presented.

The list of accredited schools still increases. Five names have been added this term, and the Regent is under engagement to visit several others as soon as the nature of his duties will permit.

Miss Jennie C. Mahan resigned her position as instructor of instrumental music, at the end of last term. By authority of the Executive Commttee, Mrs. C. E. Maltby, of Champaign, well and widely known as a successful teacher, was appointed to fill the vacancy for the rest of the current year,

The class in Calisthenics has been efficiently taught by Mrs. Scovell; while there is sufficient interest among the pupils, parents are continually demanding the withdrawal of their daughters from this exercise. I recommend that it be discontinued during the remainder of the current college year.

THE CATALOGUE.

The time approaches for the issue of the annual catalogue. I request that authority may be given to issue an edition, corrected to conform to existing regulations, to consist of 5,000 copies.

I transmit the reports of Prof. Burrill upon the Horticultural and Botanical work, and ask attention to the recommendations which he makes.

In addition to the general appropriations for the next six months, which are presented in the schedule of the Business Agent, I recommend the following special items:

From State appropriations for Cabinets:		
For the Botanical Cabinet	$25 00	
" the Natural History Museum (balance)	206 12	
		$231 12
From State appropriations for Laboratories:		
For microscope stands and section cutter	$105 00	
" Chemical Laboratory, as per schedule of Prof. Weber	191 90	
" Physical Laboratory—for apparatus (balance)	407 96	
		704 86
For repairs of Astronomical Transit	$12 00	
" transfer of models from Arch. shop to dep't of Civil Engineering	25 00	
" expenses of examining schools	50 00	
" books, periodicals and binding, the balance of State appropriations	575 02	
For expenses of bringing home Springfield exhibit	150 00	
" telegraph for signal station (before appropriated but not expended)	25 00	
" engineering printing	10 00	

Respectfully submitted.
S. H. PEABODY,
Regent, *pro tempore*.

ILLINOIS INDUSTRIAL UNIVERSITY,
COLLEGE OF AGRICULTURE, March 3, 1881.

Dr. S. H. Peabody, Regent.

SIR: During the term now in progress, the classes taught we have numbered 7 in Rural Economy and 13 in Animal Husbandry.

In interest manifested and work done these classes compare well with those of former years. It is worthy of notice that among the best students are some who are here for the Farmers' Course, or even for but a single term of this.

The Agricultural Institute held in January last was one of the most valuable yet held, but owing to various causes the attendance was smaller than in former years. These annual meetings I believe fully repay their cost. Some of the lectures given have attracted considerable attention.

During the quarter I have attended and delivered lectures before two meetings of Agricultural Associations. Such work I have found helpful to the Agricultural Department of the University.

The weather has been such that little work has been done on the farms aside from the care of the stock. The farm teams have, however, drawn most of the coal used at the University during the winter.

The live-stock on the farms is in good health and condition, especially in consideration of the fact that there is not sufficient stable or shed room to give shelter to all. It is hoped this may be provided before another winter. Some sales of stock have been made at remunerative prices. Three old and inferior horses have been sold. It is expected to replace them with young mares of superior quality suitable both for the farm work and for breeding purposes. So far as has been practicable, I have consulted yourself or the Chairman of the Farm Committee in regard to sales and purchases.

After consultation with Mr. Scott and yourself I have engaged T. F. Hunt, a special Agricultural student, to act as Foreman and Assistant on the Farm, to commence work at the close of the present term. Mr. Hunt is young, but is well informed and experienced in practical farm work. As he is desirous of continuing his practical studies in general and experimental work he is well content to receive barely more than the wages of a common laborer, or $30 per month.

The farm laborers who gave good satisfaction last year have been re-engaged for this season.

If it is practicable to have any definite action taken in regard to erecting a Laborer's Cottage, in advance of the Legislative action as to appropriations, it is very desirable that arrangements be made. One of the farm laborers is temporarily occupying the "Farm House" assigned for my use, and is boarding the other laborers employed on the Experimental farm. It is desirable that this man should be as near the barns as is practicable, yet it will be highly inconvenient unless I can reside on the farm. This man formerly occupied rooms in one of the small dormitories. This arrangement is undesirable, except in a case of necessity.

It would be desirable to have the dairy house this spring, but this can be dispensed with until next fall.

Some embarrassment is felt in making plans as to the growth of sorghum, owing to the fact that an appropriation has been asked from the Legislature, and parties interested, to enable the University to carry out some more costly experiments than would be practicable with the funds now available. The quantity of cane to be grown will depend on the granting or refusal of this appropriation.

The following work is proposed for the early spring, aside from the ordinary routine work of the farms:

1. Placing the hedges and other fences in thorough repair.

2. The thinning and the trimming of the rows of trees bordering the Experimental Farm.

3. Enclosing a plat of seven acres on west side of roadway leading from Main Building to Farm House, and division of field of eighty acres in front of house on Stock Farm into equal parts, by fence along roadway to house.

4. Planting a row of trees on each side of roadway last named, and a few clumps of trees in the field in front of Stock Farm Buildings.

Trees for shade and ornament should also be planted in a number of places on each farm.

5. Building piggery, etc., Experimental Farm, authorized at former meeting.

6. Building tight board fence enclosing yard, to eastward of Experimenal Farm Barn, with shed on north side. Also, resetting fences and narrowing lots about this barn.

It is expected we will be able to do more field experimental work than for several years past.

I would be gratified to have members of the Board visit the farm at their convenience.

Respectfully submitted,
G. E. MORROW,
Prof. Agriculture.

The Board proceeded to consider the recommendations contained in the Regent's report.

The action of Prof. Morrow in regard to the Foreman of the Farm, was approved.

The Regent's recommendation in regard to Calisthenic exercises, was approved.

The matter of the catalogue was referred to a committee consisting of the Regent, Messrs. Scott and Gardner.

Sixty dollars were appropriated for the purchase of gates, under direction of Prof. Burrill and Business Agent.

The following assignments from State appropriations were made: Botanical Cabinet, $25; Natural History Museum, $206.12; Microscope and Section Cutter, $105; Chemical Laboratory, $191.90; Physical Laboratory, $407.96; Books and publications, $575.

The following appropriations from current funds were made: Repair of Astronomical Transit, $12; Models for Civil Engineering Department, $25; expenses in visiting schools, $50; expenses of Springfield exhibition, $150; Blue Printing for Engineering Department, $10.

The Treasurer then read his report, which was received, and presented warrants for two years, which were referred to Messrs. Fountain and Mason for audit:

ILLINOIS INDUSTRIAL UNIVERSITY,

To JOHN W. BUNN, *Treasurer.*

	Cr.		
1880.			
Dec. 18.....	By balance.....	.....	$9,343 88
1881.			
Jan. 1.....	By interest on $27,000.....	.....	1,080 00
	" interest on Chicago 7 per cent. water bonds.....	.....	875 00
	" interest on Champaign county bonds.....	.....	4,600 00
	" interest on Leib's note.....	.....	300 00
Feb. 29.....	" amount received on account Architectural Department.	$398 32	
	" " " " " Agricultural " ..	704 25	
	" " " " " Horticultural " ..	147 67	
	" " " " " Mechanical " ..	578 89	
	" " " " " Chemical " ..	706 46	
	" " " " " Military " ..	7 50	
	" " " " " Buildings and grounds....	85 79	
	" " " " " Fuel and light.....	106 22	
	" " " " " Library and apparatus....	60	
	" " " " " Fees.....	2,536 25	
	" " " " " Tuition in Prept'y Dep't...	639 00	
	" " " " " Illinois C. R. R. donation..	951 15	
			6,862 10
			$23,060 98

ILLINOIS INDUSTRIAL UNIVERSITY,

To JOHN W. BUNN, *Treasurer.*

	Dr.		
1881.			
Feb. 28.....	To amount paid Salaries.....	$6,922 78	
	" " " Board expense.....	276 81	
	" " " on account Buildings and grounds.....	50 00	
	" " " " " Fuel and lights.....	1,774 75	
	" " " " " Stationery and printing.....	108 16	
	" " " " " Furniture and fixtures.....	12 51	
	" " " " " Mechanical department.....	585 85	
	" " " " " Architectural "	531 32	
	" " " " " Agricultural "	1,245 72	
	" " " " " Horticultural "	85 85	
	" " " " " Chemical "	107 15	
	" " " " " Military "	24 33	
	" " " " " Library and apparatus.....	24 80	
	" " " " " Incidental expenses.....	65 61	
			$11,815 64
	" " " " " Preparatory department.....	$455 00	
	" " " " " Springfield exhibit.....	488 58	
	" " " " " Physical laboratory.....	3 00	
	" " " " " Cabinets.....	4 15	
	" " " " " Examining schools.....	10 08	
	" " " " " Agricultural institute.....	18 25	
			979 06
	" " " " " State appropriations:		
	" " " " " Cabinets.....	$73 36	
	" " " " " Heating.....	2 57	
	" " " " " Ventilation and W. C.....	104 99	
	" " " " " Buildings and grounds.....	546 89	
	" " " " " Mech. and Arch. shops.....	330 00	
	" " " " " Chem. and Phy. Laboratories	557 00	
	" " " " " Books and publications.....	209 57	
			1,824 38
	Balance.....	.....	8,441 90
			$23,060 98

URBANA, March 8, 1881.

JOHN W. BUNN, *Treasurer.*

Adjourned to 8:30 A. M.

—12

SECOND DAY'S SESSION.

The Board assembled at 9:45 A. M. Present—Messrs. Cobb, Mason, Scott, Fountain, Gardner and Millard.

Prof. Burrill was authorized to employ a proof-reader for the biennial report now being printed in Springfield.

The following resolution was offered by Mr. Millard, seconded by Mr. Scott:

Resolved, That the thanks of this Board be extended to Colonel C. F. Mills, Assistant Secretary of the State Board of Agriculture, for the generous gift of a valuable, finely bred Jersey bull calf, received March 7, 1881.

Resolved, That the Secretary is hereby instructed to send to Col. Mills a copy of this resolution.

Adopted.

The Farm Committee made a verbal report concerning the lease of the Griggs farm, and were given authority to make such lease at their discretion.

On motion of Mr. Gardner, the Board proceeded to the regular order of business, the election of officers.

On motion of Mr. Mason, the following officers were unanimously elected:

Mr. Emory Cobb, President of the Board.

Mr. John W. Bunn, Treasurer.

Prof. E. Snyder, Recording Secretary.

Prof. T. J. Burrill, Corresponding Secretary.

Prof. S. W. Shattuck, Business Agent.

On motion of Mr. Millard, Messrs. Cobb, Scott and Gardner, were appointed Executive Committee.

The following resolutions, offered by Mr. Scott, were unanimously adopted:

WHEREAS, The Hon. Emory Cobb has been named to the President of the United States for appointment to be Commissioner of Agriculture;

Resolved, That the members of the Board of Trustees of the Illinois Industrial University, of which Board Mr. Cobb has been from its organization a member, and for many years its president, do most heartily endorse and approve this nomination. They believe that his long and intimate acquaintance with both the agricultural and commercial interests of the country, his clear insight, sound judgment and unwavering fidelity, fit him peculiarly for discharging the many and difficult duties of this most important office, and they earnestly pray that the appointment may be made.

Resolved, That a copy of these resolutions be spread upon our records, and be forwarded to the President of the United States.

It was resolved that the action of this Board, taken at the March meeting, 1880, relative to the Preparatory Department, be rescinded.

The Executive Committee communicated a report of the Faculty, upon the continuance of the School of Domestic Science, containing a recommendation that the school be discontinued; after hearing which, it was moved and carried that the report of the Faculty in regard to the School of Domestic Science, be approved, and that the Regent and committee revising the catalogue be, and they are hereby, instructed to incorporate the studies of the said school, as far as practicable, into the other regular courses of the University.

Upon motion of Mr. Scott, seconded by Mr. Mason, it was resolved, that Dr. S. H. Peabody be, and he is hereby, elected Regent of the University for the ensuing two years, at a salary of $3,000 per annum.

It was resolved that the Executive Committee be, and they are hereby, authorized to submit to the Attorney General of the State

the evidence of title to the old dormitory building and grounds upon which it stands, and to obtain from him his opinion on the following points:

I. Can the Trustees sell or remove the building now standing, without prejudice to their title of the grounds.

II. Have the Trustees a right to sell the grounds and building; or the building, or any part of the grounds, and convey the same.

It was resolved that the Executive Committee and the Regent (in event the Board shall have power to do so) advertise for bids for the old dormitory building and material, to be removed and the grounds to be cleared by December 1st, 1881; also, for bids for the building and the north part of the grounds, such bids made subject to the right of this Board to accept or reject at their meeting in June, 1881.

The report of the Business Agent was read and ordered to be filed:

Statement of Current Appropriations and Receipts, February 28, 1881.

	Applied.	Received.	Expended	Balance.
Board expense	$650 00		$648 01	$1 99
Salaries	15,200 00		13,334 56	1,865 44
Fuel and lights	2,500 00	$169 94	2,889 79	219 85
Stationery and printing	300 00		291 07	8 93
Buildings and grounds	100 00	166 28	107 00	159 28
Incidental expenses	200 00		106 26	93 74
Fixtures and furniture	100 00		46 75	53 25
Library and apparatus	50 00	2 10	62 72	10 62
Mechanical Department	176 68	920 83	970 18	127 33
Architectural Department	419 27	1,340 72	1,296 45	463 54
Agricultural Department	4,315 21	4,274 39	2,600 11	5,989 49
Horticultural Department	43 50	223 71	246 58	20 63
Chemical Department	16 57	1,106 46	952 09	170 95
Military Department	50 00	7 50	40 57	16 93
Sundries—Physical Laboratory	67 07		6 35	60 72
Cabinets	29 25		22 35	6 90
Chicago Exposition	25 00		5 45	19 55
Colored engineering printing	10 00			10 00
Models, C. E	25 00		15 75	9 25
Spring exhibit	500 00		505 45	5 45
Visiting schools	50 00		10 08	39 92
Farmer's Institute	100 00		18 25	81 75
Signal station	25 00			25 00
Students' government	25 00			25 00
Student fees		5,945 50		
Tuition, preparatory		1,429 00	1,100 00	
I. C. R. R. donation		1,646 25		

Statement of State Appropriations and Receipts, February 28, 1881.

	Applied.	Received.	Expended	Balance.
Taxes on Lands	$5,000 00	$4,493 02	$4 493 02	
Buildings and grounds	5,000 00	5,000 00	4,856 61	$143 39
Chemical and Physical laboratories	2,000 00	2,000 00	1,295 14	704 86
Mechanical and architectural shops	3,000 00	3,000 00	2,631 67	368 33
Books and publications	3,000 00	3,000 00	2,424 98	575 02
Cabinets	1,000 00	1,000 00	768 88	231 12
Ventilation and W. C	2,500 00	2,500 00	2,500 00	
Heating apparatus	3,000 00	3,000 00	3,000 00	

The following appropriations from current funds were made for the six months ending August 31, 1881:

Board expense		$300 00
Salaries		13,110 00
Fuel and lights	$1,000 00	
Stationery and printing	400 00	
Buildings and grounds	100 00	
Furniture and fixtures	100 00	
Military Department	50 00	
Library and apparatus	100 00	
Incidental expense	200 00	
		1,950 00
Mechanical Department, balance		127 33
Architectural Department, balance		463 54
Agricultural Department, balance		5,989 49
Horticultural Department, balance		20 63
Chemical Department, balance		170 95
Sundries—Physical Laboratory		60 72
Cabinets		6 90
Students' Government		25 00
Total		$21,924 66

Mr. Scott was appointed a committee to audit vouchers presented and report at the next meeting.

The committee to whom was referred the Treasurer's warrants, made the following report:

To the Hon. Board of Trustees:

The undersigned, committee appointed to examine vouchers of Treasurer from March 15, 1879, to March 1, 1881, respectfully report that they have examined vouchers as follows: Nos. 393 to 747, March 15, 1879 to August 31, 1879; Nos. 1 to 748, September 1, 1879, to August 31, 1880; No. 1 to 374, September 1, 1880, to March 1, 1881, and find them correct and corresponding with the Treasurer's books and reports.

T. T. FOUNTAIN,
R. B. MASON,
Committee.

Petitions having been received from members of the Military Class of 1880 for commissions, the matter was referred to the Faculty, with instructions to report on the merits of the case at the next meeting of the Board.

E. SNYDER,
Secretary.

EMORY COBB,
President.

BOARD MEETING, JUNE 8, 1881.

The Board assembled at 4 o'clock P. M., in the University parlor.

Present: Messrs. Cobb, Bennett, Fountain, Paden, Pearman and Scott.

Absent: Governor Cullom, Messrs. Bird, Millard and McLean.

Judge Bryan administered the oath of office to Messrs. Bennett, Paden and Pearman.

The minutes of last meeting were read and approved.

The Regent then read his report, before finishing which, however, a recess was taken until 7:30 P. M.

EVENING SESSION.

The Board met at 8 P. M., present as before.

The Regent completed the reading of his report, which was received:

To the Trustees of the Illinois Industrial University:

GENTLEMEN—I have the honor to present a report of the first year of my service as Regent under your appointment.

The work of the University has been carried on steadily and satisfactorily on the part of both students and instructors. The number of students of all grades has been less by about forty than in the year preceding, but the difference was in the less number of special students in music, and of younger pupils in the preparatory class. The number of matriculated students, members of regular college classes, was thirty more than last year, and greater than in any previous year since regular classes were organized. The quality of the work done in the several class rooms is believed not to have fallen below former standards in any case, while in certain departments notable progress has been made. The Senior class has been large, and its influence has been healthful and salutary:

The number presented for graduation, whose names are given in the following list, is forty-six, the largest class yet issued from the University.

The Faculty recommend that Degrees be conferred and Certificates granted, as follows:

FOR THE DEGREE OF BACHELOR OF SCIENCE.

In the College of Agriculture.

John C. Dressor—Cottonwood Grove.
William K. Mason—Buda,

In the College of Engineering.

Arthur Boothby—Pittsfield.
Frank W. Hammett—Camargo.
Ethan Philbrick—Baileyville.
Arthur N. Talbot—Cortland.

In the College of Natural History.

James E. Armstrong—Seneca.
Frederic E. Cooper—Girard.
Virginia M. Hammett—Camargo.
J. Ora Pearman—Champaign.
Herman S. Pepoon—Warren.
Francis M. Pletcher—Plattsville.
Sprague D. Ross—Cottonwood Grove.
Arthur B. Seymour—Camp Point.
Byron A. Slade—Sycamore.

FOR THE DEGREE OF BACHELOR OF LETTERS.

In the College of Literature and Science.

Bayard Beach—Champaign.
Ralph L. Brown,
Archibald O. Coddington—Champaign.
Arthur E. Davis—Salem.
Charles H. Dennis—Decatur.
Willis A. Mansfield—Marengo.
Francis M. McKay—Ottawa.
Morelle M. Stacy—Princeton.
James B. Sturman—Dahlgren.
William S. Weston—Champaign.
T. Crawford Hill—Tolono.
Miss Bertha E. Barnes—Champaign.
Miss Marietta Davis—Monticello.
Miss Loretta K. Elder—Mattoon.
Miss Lucie M. Lawhead—Champaign.
Miss Darlie Thomas—Champaign.
Miss Jennie A. Wright—Champaign.
Miss Metta M. Irene Macknet—Girard.

FOR THE DEGREE OF MASTER OF LETTERS.

In the College of Literature and Science.

Ralph L. Brown.

For full Certificates in Agriculture.

Maxwell B. Wilson—Paris.
Comma N. Boyd—Sheffield.
William A. Pepoon, Warren.

In Engineering.

Fred. L. Hill—Paxton.

In Chemistry.

Albert Bellamy—Girard.
Arthur H. Kingman—Wakefield, Mass.
Joseph Schwartz—Salem.
Frank L. Birney—Urbana.

In English and Modern Languages.

James G. Allison—McKinney, Texas.
John H. Ulorse—Cazenovia.
Frank H. Porter—Garden Prairie.
Kittie M. Baker—Champaign.
Nettie E. Lawrence—Belvidere.

In this connection I would recommend that the form of the diploma of the University be so changed as to require only the signatures of the President and Recording Secretary of the Trustees, the Regent, as President of the Faculty, and the Secretary of the Faculty. The inconvenience of the present form is obvious.

APPROPRIATIONS.

Under your direction, a bill was drawn, and was presented to the Legislature through the usual channels. It was favorably received by the committees of both House and Senate, and passed the Senate without reduction. After some amendments by the House of Representatives, the bill finally passed, making the following appropriations:

For taxes	$2,500	per anuum
For building and grounds	2,500	"
For Laboratories	800	"
For machine shops	1,500	"
For library	1,500	"
For library cases	800	
For museum	1,000	
For current expenses of instruction	5,700	per annum
For engineering instruments	1,000	
For furniture	1,000	
For boiler house	5,000	
For boiler and ventilation	2,500	
For dairy house and farm cottage	1,000	
Total appropriations for two years		$41,300

It may be deemed a reasonable cause of congratulation that the Legislature of the State of Illinois has recognized the claim of the University to assistance other than that derived from the national endowment, and has placed this recognition upon record. The sum given towards supplying the deficit arising from the depreciated rate of interest, will enable the institution to maintain its present status for the next two years, although it will not permit the advance which the friends of the University desired, and which its growth demands. On the basis which this assistance provides it will be possible to arrange for supplying the immediate wants of the various departments.

The arrangement under which the work was planned for the past year was understood to be only a temporary expedient, which cannot continue, considering either the good of the service or the endurance of those in service. To meet present necessities the following changes are recommended:

1. That the Regent retain the general direction of the instruction in Mechanical Engineering and Physics, and that an Assistant Professor of Mechanical Engineering be appointed.

2. Prof. Crawford has taught the classes in History, formerly under the instruction of Dr. Gregory, and has performed the duty with great fidelity and success. I recommend that his title be changed to that of Professor of History.

It is certain that the proper duties of this chair, with the ever-growing care of the Library, furnish ample occupation for even as active and efficient an instructor as Prof. Crawford has shown himself to be. Still it may be possible for him to direct the work of the chair of Ancient Languages, and to assist in teaching the classes in that department.

3. If the finances of the University would permit I should advise the appointment of a full Professor of Ancient Languages. This would not be the establishment of a new professorship, but the maintenance of the present status, while the formal appointment of a Professor of History is but giving due recognition to a line of study which has long been held of great importance in all the courses of this University. If, however, such an appointment cannot be made, the work may be carried for the present year by Mr. Charles Pickard, with some help in the English teaching, now done by him.

4. The determination reached by the Board at its last meeting, to continue the Preparatory class, makes further provision necessary for the instruction of that class. The

departure of Mr. C. I. Hays, in April, left a vacancy then, and there are some changes in the course of that year, which must be provided for. I recommend the appointment of Mr. C. W. Rolfe, now of the public schools of Kankakee, to be Instructor of Mathematics, and Mr. James E. Armstrong to be Taxidermist and Assistant in Natural History.

Prof. Rolfe is a graduate of the University, and has heretofore served acceptably as a teacher in its preparatory work. Besides the mathematical instruction, he would give some valuable assistance to Prof. Burrill. Mr. Armstrong is a member in the present graduating class, of high standing in his specialty. He has taught certain items in the department of Natural History during the past year, and with commendable success.

5. I recommend that a suitable person be employed as Foreman of the Green House, who shall give his entire attention to its care, and to the horticultural and ornamental work of that nature about the University. I believe that such a man can make that part of our business pay a reasonable profit and become a help to our exchequer, but to do that he must give his time to it, with only such teaching as pertains to the practical work of the greenhouse and the garden. As this department is under the immediate care of Prof. Burrill, it would be proper that his wishes should be consulted before making an appointment.

6. The question of the appointment of a Preceptress is still an open one. The lack of such an officer during the year now closing, has not caused any noticeable inconvenience. The young ladies have attended to their work as faithfully, as quietly, as properly, as in preceding years. No cases have arisen in which any discipline or special care seems to have been needed, which required the management of a woman. The practical difficulty appears to be the assignment to a lady of such duties in instruction as shall give her proper and adequate position in the University.

7. The instruction in Music during the past year has attracted but very few pupils. It has made no draft upon the treasury, and but little figure in the working of the courses of instruction. It is possible that some arrangement may be perfected during the vacation by which this work may be provided for, and a Preceptress secured at the same time. Yet the music does not appear to promise an adequate support to a competent teacher. Several young ladies have applied from time to time for appointment, but none who would do more than give instruction in the elements of piano forte instruction. Unless something of more dignity, and more in harmony with the general character of the University, can be done, it might be better to cut off the department altogether.

8. I would suggest that the appointment of a teacher of elocution be referred to the Faculty, as last year.

The following gentlemen have asked either in person, or by letter, that I would indicate to you their wish to have their salaries increased: They are Prof. Prentice, Prof. Baker, Prof. Scovell and Mr. Kimball. They are all good and faithful men, each fitting excellently into the position occupied. Dr. Prentice has been engaged in his present work for seven years, and is well known as an expert in his profession. The Board added an important item to his duties last year, but did not raise his compensation.

Prof. Baker is filling with great efficiency the chair vacated some years since by Prof. Webb, and I believe, with a very happy influence upon his students. He has also done important service in filling vacancies, which the Board should not forget. Prof. Scovell has made good progress in his department. Mr. Kimball is a man of rare qualifications for the duties devolving upon him, and his departure would make a vacancy which would be very difficult to fill. Mr. Sondericker has done the best work in the department of Right Line Drawing that has been done there for five or six years, or since it was in the hands of Prof. Baker. I recommend his re-engagement for the next year. Prof. Weber desires that Mr. C. C. Barnes be appointed First Assistant in the Chemical Laboratory in place of Mr. Henry Beardsley, who withdraws from the service to pursue his professional studies. I concur in the request of Prof. Weber.

Mr. Charles E. Pickard desires to remain in his present position, and will continue to do good service as in the past.

BUILDINGS AND IMPROVEMENTS.

In accordance with the instructions of your Board, inquiries were addressed to the Attorney General of the State, as to the authority vested in the Board to sell or otherwise dispose of the Old Dormitory Building, and the ground on which it stands, or of either. The opinion was given, very broadly denying the authority of the Trustees to sell either the real or personal property of the University, without authority from the Legislature. Finding that the opinion, if followed according to its literal interpretation, would seriously interfere with the current business of the University, I addressed a second communication to the Attorney General, asking a more specific interpretation of the first, which he gave. Both these documents are herewith presented.

On the evening of Friday, May 27, a box containing combustibles and an ignited train was found in the basement of the building. Had it not been discovered in consequence of a fire which consumed the out-building in the rear, this lighted train would at a later hour have started a fire which would doubtless have consumed the dormitory. It is customary to charge any such offense to students, and it is possible that students were the perpetrators in this case, although the condition of the train, as I carefully examined, leads me to think that it was arranged by one who had acquired practical experience in such matters.

It was clearly my duty to take precautions against the repetition of the attempt, and I accordingly obtained from the Mayor of Urbana a special guard, who have had constant attendance at the building, and will continue such care, until you shall direct what other steps shall be taken. At the least, the building contains material too valuable to be wasted. The appropriations made by the Legislature for the constructions you have desired to erect, were cut down somewhat from the estimates made. I have had the estimates revised to see what saving could be made by using old material where it can

be done suitably, and find that on the boiler-house, dairy house, and farm cottage about $1,500 may be so saved, which will go far towards replacing the reduction of $3,000 made on these items by the Legislature. I take leave to recommend as the best solution of the whole matter, that you give directions to take down the Old Dormitory, and stack the material on the ground where it now stands, and that so much of that material as can be profitably used in the buildings to be erected this summer, be so used. I further recommend that the Dairy House and the Farm Cottage be built of brick instead of wood, and that our architect be instructed to arrange plans for those buildings which shall be adapted to the use of this material.

I advise that steps be taken at once to put these three buildings under contract, or otherwise into process of construction, as shall seem best to you.

Farther, that provision be made for the purchase and setting of a new boiler, and for carrying out the proposed changes in the method of heating and ventilating.

BUILDINGS AND GROUNDS.

The usual appropriations having been made for this department, I would call attention to these items:

1. The exterior woodwork of the main building has never been painted since it received paint at the erection of the building, seven years ago, and requires thorough repainting.

2. The east and west doors of the main building and the basement door of the chemical building should be covered with suitable shelters or porches, to protect from rain in summer, and to be lined with boards, to protect from cold in winter.

3. A neat, plain, and substantial fence should be placed in front of the University Grounds on the south line of Green street.

4. The bridge in the Arboretum needs repair.

5. A new floor is desirable in the Library.

FURNITURE.

An appropriation having been made for furniture for the main building, I suggest that the purchase thereof be referred to a committee of the Faculty.

LIBRARY.

As binding may be procured during the dull time of summer at better rates than later in the season, an appropriation of $200 is asked for that purpose.

It is suggested that cases be extended along the south side, with balcony similar to those along the east side, and that the movable cases thus relieved be arranged in alcoves at the south end. This arrangement will increase the permanent book room, in such a way as to keep the administration within the closest compass, and, therefore, most practical and useful.

CARPENTER'S SHOP.

I submit a communication from Prof. Ricker, in which the wants of this shop are set forth, and concur in the recommendations.

I ask that like authority be given to the Business Agent to purchase material for use in the Machine Shop, for the work of the vacation.

I invite attention to a letter from Hon. C. B. Smith.

THE MILITARY DEPARTMENT.

I submit a communication from Prof. Wood, concerning the establishment of a rifle-range for target practice of students. The range is a desirable addition to the facilities of that department, but serious objections exist, in my opinion unsurmountable, to the opening of such a range in the immediate vicinity of the University building.

A petition for change of officer's uniform has been submitted to the Faculty. It is a change desired by the military Professor, and is transmitted to you by the Faculty with their approval.

The Faculty also request me to present to you the accompanying report, upon the subject of giving commissions to the students in the military class of '80. The report is made in obedience to your request at the last meeting of the Board.

CHEMICAL DEPARTMENT.

The report of Prof. Weber is communicated, and its requests are approved.

MUSEUM.

The requests of Prof. Taft are communicated and approved.

DEPARTMENT OF CIVIL ENGINEERING.

I present the communication of Prof. Baker concerning the purchase of the engineering instrument, anticipated in the askings made of the Legislature, and appropriated for. I would recommend that the matter be referred to a suitable committee, with power to act.

TELEPHONE EXCHANGE.

I am informed that a telephone exchange is to be erected in the cities of Champaign and Urbana. A proposition has been made to the University to join in this enterprise which I submit. I think that such connection would be useful, if suitably regulated, and might partly pay its expenses.

Prof. Ricker and Prof. Baker ask leave of absence for one month of the vacation.

Prof. Crawford and Prof. Roos ask leave until September.

Prof. Burrill's request for microscopes is concurred in.

Respectfully submitted, S. H. PEABODY, *Regent*

The Board proceeded to the consideration of the recommendations contained in the report.

The suggestion in regard to signatures to Diplomas was approved.

Professor J. D. Crawford's title was changed to "Professor of History and Ancient Languages."

Professor Burrill was requested to make a nomination for a Foreman of Horticultural Department, to the Board, at its next meeting.

The Regent and Faculty were authorized to provide for instruction in music and elocution for the next year, as provided in catalogue.

The following appointments were made for the next collegiate year:

Charles E. Pickard, Assistant in Ancient Languages, at $90 per month, for ten months.

Charles W. Rolfe, Instructor in Mathematics and Botany, at $75 per month, for ten months.

Jerome Sondericker, Instructor in R. S. Drawing, at $60 per month, for ten months.

James E. Armstrong, Instructor in Natural History, at $40 per month, for ten months.

C. C. Barnes, Assistant in Chemical Laboratory, at $40 per month, for ten months.

Adjourned to 8 o'clock A. M.

SECOND DAY'S SESSION.

The Board met as per adjournment. Present as before.

The Degrees and Certificates as recommended by the Faculty, were granted.

After signing the Diplomas a recess was taken, to witness the Drill of the University Battalion and attend Commencement Exercises.

At 3 o'clock P. M. the Board reassembled and continued the session.

Mr. Scott presented the following report:

To the Honorable Board of Trustees:

Your committee, to whom were referred the vouchers for the three months ending February 28th, 1881, has examined such vouchers from No. 189 to 374, inclusive, and find them to be correct.

JAMES R. SCOTT.

The Board then took up again the Regent's report for consideration.

The salary of Prof. F. W. Prentice was increased to $1,500; that of Prof. I. O. Baker to $1,500; and that of Prof. M. A. Scovell to $1,200. The salary of Mr. E. A. Kimball was fixed at $1,020 per annum, or $110 per month for twelve months.

It was moved by Mr. Millard, seconded by Mr. Scott, that Professors Snyder and Burrill be paid $200 per annum in addition to

their regular salaries, for their extra work as secretaries, and that Professor Morrow be paid $200 per annum extra, while he continues his present duties as manager of the farms and Professor of Agriculture, such compensation to begin with the year commencing September 1st, 1881. Carried.

The following resolutions were passed:

WHEREAS, the old Dormitory building is partially destroyed and totally unfit for use as well as dangerous in its present condition; therefore,

Resolved, That the Regent and the Executive Committee be, and they are hereby, authorized to take down said building, saving all the material in the best manner possible, that it may be utilized for the best interests of the University.

It was moved by Mr. Millard, seconded by Mr. Fountain, and passed, as follows:

Resolved, That the Executive Committee, together with the Regent and Business Agent, be, and they are, hereby instructed to erect a new boiler house to receive the boilers of the main and chemical buildings, and to construct the necessary chimney, smoke and air flues connected therewith, and to remove the boilers thereto from the buildings aforesaid, as per plans and estimates submitted to this Board; said committee being authorized to modify the plans in their detail, as may be found advisable, provided that the total expense shall not exceed the appropriations therefor.

Resolved, That they be further directed and instructed to purchase a boiler and steam pipes, additional steam coils and service pipe, and continue the improvements in the ventilation of the main building, and to repair the heating apparatus therein.

Resolved, That the Executive Committee, Regent, Business Agent and Professor Morrow be further authorized and instructed to erect a farm cottage and dairy house; the cost of the respective erection and improvements not to exceed the appropriation made by the Legislature, except that in the erection of the farm cottage and dairy house any additional expense may be taken from the material on hand belonging to the University.

Resolved, That the Executive Committee and Business Agent draw from the State appropriation such funds, and at such times, as may be necessary for the purposes aforesaid.

It was resolved that the request of the Regent, in regard to painting of outside woodwork on main building and shelters, be referred to the Executive Committee and Regent, with power to act.

The Regent and Business Agent were authorized to repair bridge in arboretum, as recommended.

The purchase of furniture, as by State appropriation, was referred to the Regent, Professors Shattuck and Snyder, with power to act.

Two hundred dollars from State appropriation for books were assigned for binding of books and periodicals.

The following report from the Professor of Architecture was received:

To the Regent and the Honorable Board of Trustees of the Illinois Industrial University:

GENTLEMEN: I beg leave to present the following recommendations in behalf of the Architectural Department, for your consideration.

1. That the Business Agent and Regent be authorized to make such purchases of lumber and other materials as may be required for the work which is carried on during the summer vacation.

2. That one of Barnes Bros. Formers be purchased for the Architectural Shops, with a set of knives. The whole will cost $39 and freight from Rockford, Ill.

3. That $35 be expended for materials for use of class in Shop Practice, such as ornamental woods, etc.

4. That Mr. N. S. Spencer be employed as Foreman of the Architectural Shop for the next year, commencing July 1, at a salary of $2 50 per day for actual work, for July and August, and $50 per month for the ensuing ten months of the next college year.

5. That $50 be appropriated for purchase of new tools for Architectural Shop.

6. That $15 be appropriated for a set of emory wheels to use in wood lathe, for making and sharpening steel bits for whittler and moulding machine.

7. That $25 be appropriated to the Blue Printing Laboratory of the College of Engineering, for additional printing frames and apparatus.

I would recommend that permission be given to the Regent and Business Agent to run the Architectural Shop during the summer vacation, as this will be necessary if any part of the work of the new buildings be done by the University.

It will not be necessary to run the machinery more than a portion of the time, probably two or three days per week.

Very respectfully submitted,

N. CLIFFORD RICKER, *Professor of Architecture.*

The requests were approved and granted, and the Business Agent directed to purchase material for the shops for work during vacation.

A communication from Judge Smith was referred to the Executive Committee, to report at next meeting.

A request from the students of the Military Classes, endorsed by Lieutenant Wood, asking for certain changes of uniform for officers, was granted.

The report of the Faculty on the subject of commissions, asked for by the Military Class of 1880, was received and approved, and the Secretary instructed to notify the members of said class that their request is not granted.

Recess was then taken till 8:30 P. M.

EVENING SESSION.

The Board assembled on time, present as before.

The vacancy in the Executive Committee was filled by the appointment of Dr. Pearman *vice* Gardner.

The Regent, Business Agent and Professor Baker were appointed a committee to purchase engineering instruments.

For purchases for museums $200 were assigned for State appropriations, to be expended under direction of a committee consisting of the Regent, Business Agent and Professor Taft.

Professor Weber's request for an appropriation of $180 to continue experiments with sorghum cane, was granted; also, the usual replenishing purchase of chemicals from current funds, allowed.

The connecting of the University Signal Station with the Western Union Telegraph Office, also with telephone, was referred to the Regent and Executive Committee for report at the next meeting.

The President and Recording Secretary were directed to make out the requisitions to the State Auditor for State appropriations due the University July 1, 1881.

The Treasurer then read his report, which was received and filed:

ILLINOIS INDUSTRIAL UNIVERSITY,

To JNO. W. BUNN, *Treasurer.*

1881.	DR.			
May 31	To amount paid for Board expense	$31 10		
	" " " Salaries	6,767 86		
	" " " Agricultural Department	2,176 55		
	" " " Architectural Department	523 31		
	" " " Mechanical Department	362 16		
	" " " Horticultural Department	159 49		
	" " " Chemical Department	281 53		
	" " " Fuel and lights	750 47		
	" " " Stationery and printing	436 08		
	" " " Buildings and grounds	43 81		
	" " " Fixtures and furniture	9 49		
	" " " Military Department	48 15		
	" " " Library and apparatus	6 65		
	" " " Incidental expense	24 67		
				$11,621 32
	" " " Tuition in Preparatory Dep't	$475 00		
	" " " Physical Laboratory	19 26		
	" " " Cabinets	10 33		
	" " " Repair of Transit	9 70		
	" " " Expenses, examination of Schools	7 57		
				521 86

Treasurer's Report—Continued.

	State Appropriations:		
May 31.....	To amount paid for Books and publications.....	$374 98	
	" " " Chemical and Phys. Laboratories..	520 08	
	" " " Mechanical and Arch. Shops.....	334 74	
	" " " Buildings and grounds.....	98 53	
	" " " Cabinets.....	73 55	
	" " " Taxes on lands in Minnesota and Nebraska.....	2,310 37	
			$3,712 25
			$15,855 43
1881.	CR.		
March 8...	By balance.....		$8,441 90
31...	" amount received for fees.....	$1,720 00	
	" " " " tuition in Preparatory Dep't...	400 00	
	" " " on account buildings and grounds.	71 50	
	" " " on account fuel and lights.....	30 46	
			2,221 96
April 1.....	By interest on Sangamon County Bonds.....	$750 00	
	" " on Douglas County District School Bonds..	350 00	
	" " on $10 Ill.....	400 00	
			1,500 00
May 31.....	By amount received on account Agricultural Dep't.....	$1,200 38	
	" " " " " Horticultural "	392 61	
	" " " " " Chemical "	400 00	
	" " " " " Architectural "	154 55	
	" " " " " Mechanical "	268 18	
	" " " " " Stationery and printing	115 00	
	" " " " " Building and grounds..	5 25	
	" " " " " Library and apparatus	60	
	" " " " " Fees.....	560 00	
	" " " " " Tuition in Prep. Dep't.	102 42	
	" " " " " Ill. C. R. R. donation...	175 75	
			3,374 74
	By balance due John W. Bunn.....	.....	316 83
			$15,855 43

URBANA, June 7th, 1881.

JOHN W. BUNN, *Treasurer.*

The report of the Business Agent was read and received, and the vouchers referred to Messrs. Scott and Pearman for audit and report at the next meeting:

Statement of Current Appropriations and Receipts, May 31, 1881.

	Applied.	Received.	Expended	Balance.
Board expense.....	$300 00	.....	$31 10	$268 90
Salaries.....	13,110 00	.....	6,767 86	6,342 14
Fuel and lights.....	1,000 00	$30 46	750 47	279 99
Stationery and printing.....	400 00	115 00	436 08	78 92
Buildings and grounds.....	100 00	76 75	43 81	132 94
Fixtures and furniture.....	100 00	.....	9 49	90 51
Military department.....	50 00	.....	48 15	1 85
Library and apparatus.....	100 00	60	6 65	93 95
Incidental expense.....	200 00	.....	24 67	175 33
Mechanical department.....	127 33	268 18	362 16	33 35
Architectural "	463 54	154 55	523 31	94 78
Agricultural "	5,989 49	1,200 38	2,176 55	5,013 32
Horticultural "	20 63	392 61	159 49	253 75
Chemical "	170 95	400 00	281 53	299 42
Sundries—Physical Laboratory.....	60 72	.....	19 26	41 46
Cabinets.....	6 90	.....	10 33	.....
Students' government.....	25 00	.....	.....	25 00
Repair of Transit Civil Engineering	12 00	.....	9 70	2 30

Treasurer's Report—Continued.

	Applied.	Received.	Expended	Balance.
Sundries—Models, Civil Engineering	$25 00			$25 00
Printing, Engineering Department	10 00			10 00
Expense of Examining Schools	50 00		$7 57	42 43
Expense of Springfield exhibit	150 00			150 00
Connecting Signal Station	25 00			25 00
Students' Fees		$2,280 00		
Tuition, Preparatory Department		502 42	475 00	27 42
Illinois Central Railroad donation		175 75		

Statement of State Appropriations and Receipts, May 31, 1881.

July 1, 1879.	Applied.	Received.	Expended	Balance.
Taxes on lands	$5,000 00	$4,493 02	$4,493 02	
Buildings and grounds	5,000 00	5,000 00	4,955 14	$44 86
Chemical and Physical Laboratories	2,000 00	2,000 00	1,815 22	184 78
Mechanical and Architectural Shops	3,000 00	3,000 00	2,966 41	33 59
Books and publications	3,000 00	3,000 00	2,799 94	200 06
Cabinets	1,000 00	1,000 00	842 43	157 57
Ventilation and Water Closets	2,500 00	2,500 00	2,500 00	
Heating apparatus	3,000 00	3,000 00	3,000 00	

Twenty-five dollars were assigned for botanical and entomological collections, from State appropriations for Museums.

A communication from Mrs. M. S. Larned and others was laid over until next meeting.

Leave of absence during vacation was granted Professors Crawford, Ricker, Baker and Roos.

Adjourned.

E. SNYDER,
Secretary

EMORY COBB,
President.

BOARD MEETING, SEPTEMBER 13, 1881.

The Board met in the University parlor at 3:30 P. M.

Present—Messrs. Bennett, Cobb, Mason, McLean, Millard, Pearman and Scott. Absent—Governor Cullom, Messrs. Bird, Fountain and Paden.

The record of last meeting was read and approved.

The Regent then read the following report, which was received:

REGENT'S REPORT.

To the Board of Trustees of the Illinois Industrial University:

GENTLEMEN; Since your last meeting attention has been given to the repairs and improvements authorized by you at that time.

A strong force was at once employed to take down the old Dormitory Building under supervision of Mr. Spencer, who was directed to use such methods as would most carefully save the material. During the progress of the work an accident occurred, due to the breaking of a decayed timber, by which two men were seriously injured. Both have recovered. It is believed that there was no lack of proper precaution, and that the University has incurred no liability on this account.

So much of the old material as could be used with profit in new construction has been so used. Of the rest enough has been sold to cover the expense of the demolition. Fair prices have been realized, and it has been thought wiser to dispose of the material than to incur a constant expense in its preservation. Meanwhile the State appropriation for buildings and grounds, needed for other purposes, will not be exhausted for this.

The new dairy house is about ready for use. The farm cottage is ready for plastering, and will be finished by the end of this month. The boiler house has the roof ready for the metallic covering, and the machinists are setting the boilers within. The stone base of the smoke stack is ready to receive the brick superstructure.

The work is now in such a state of forwardness that we expect it to be finished for use as soon as the season will require.

As soon as it was evident that the reduction of the old building would be accomplished without a serious inroad upon the fund for buildings and grounds, attention was turned to the painting of the main building, and the work is nearly finished. It is very evident that this work should have been done before, and that the property has suffered in consequence of the delay. I would suggest that the woodwork of the Mechanical building is in like need, and that it be painted this season.

Attention is called to the fence along the south line of Green street in front of the University Park. Its present condition is no credit to the State or the institution. A neat and durable fence, of cedar posts, wooden rails and iron rods, may be built at a moderate cost, and is much needed. I request that authority be granted to build such a fence, at a cost, including painting, not to exceed $500.

Part of the ceiling of the mansard story of the West Wing fell two years ago, having been loosened by water when a wind had uncovered the roof. If this ceiling be repaired and the room restored to a useful condition it can be most profitably occupied. A large amount of material is now scattered through the various engineering departments, consisting of models, drawings, shop work, etc., which would be very useful and interesting if collected, as the nucleus of a museum of engineering art. We have cases already on hand fit for the place, and much of the exhibit brought from Springfield will find there a place most suitable for its preservation. No expense need be incurred, for some time, beyond that required to put the room in order, while all the schools in the College of Engineering will be benefited by this means.

An order was passed a year ago that the balance, if any should be left from appropriation for cases to be built in the museum, should be expended for a case in Professor Morrow's room, for the preservation of agricultural specimens; but no balance was found. I recommend that an appropriation of $150 be made for a case along the west side of the Agricultural Lecture room.

The cinder walks in the park need both draining and protection from washing; this can easily be effected by laying a narrow gutter on either side, using half brick, so set as to show their square ends. We have a large supply of this material which is available for no better purpose. The position of the boiler house requires a rearrangement of the drives south of the main building.

An appropriation of $800 was made for extending the cases in Library. I recommend, that the amount be used in extending the cases and balcony along the south side and so far on the west side as may be possible, according to the style of the work now upon the east side. The movable cases displaced by this extension may be arranged compactly at the south end in such a way as to facilitate the administration of the Library, by gathering the books most used in the immediate vicinity of the place where they are issued.

This work can be done in the Architectural Shops, and can probably be made ready to put in place during the winter vacation.

I recommend that authority be given to the usual committee to expend $1,000 from the Library fund, for purchase of books and periodicals.

Prof. Taft asks for the purchase of a collection of foot-prints from the red sandstone of the Connecticut river. This collection I have inspected. It has been gathered by an expert, long engaged in searching the quarries of that very interesting locality. It could not easily be duplicated, and is fully worth the price asked, besides filling an important place in our museum.

I invite your attention to Prof. Burrill's request for an assignment from the Laboratory fund. While the sum asked is more than the exact share of the Department of Botany, the case is one in which a needed instrument cannot be had for a small price. The Professor of Chemistry cordially indorses the request, as one which will inure to the benefit of his department also.

I ask from the same fund $150 for acoustic apparatus for the Physical Laboratory.

It will be remembered that two years ago a request was made that the Machine Shop be permitted to build a drill press for its own use. This machine served, in building, as a practical lesson for two years to the students of that department by whom it was constructed. It is now finished, a very necessary and creditable piece of work, and one which attracts much attention as an exponent of the practical character of our instruction. In continuation of the same policy, and for like useful ends, I ask that authority be given to construct a milling machine, to cost not over $175. The work will extend over one year, and probably more, while the machine will add greatly to the facility of the shop.

Professor Wood renews his request, made at the last meeting of the Board, for an appropriation of $100 for construction of a rifle range. An entirely suitable place has been found on the south farm, beyond the cemetery, in which location both the Professor of Agriculture and the Regent concur.

For the usual appropriations for current expenses, I refer you to the schedule of the Business Agent, which I ask you to approve. I further suggest that from the legislative appropriation of $5,700, made at the last session, you direct that the salaries of two months be paid.

I present a report from Professors Weber and Scovell on the progress which they have made this season in the preparation of sugar from sorghum. The quality of the product is better than that of last year.

Some photographs and drawings belonging to the University yet remain at Philadelphia, which were part of the Centennial exhibit. An organization of teachers of the city of Philadelphia ask that this remainder be transferred to their collection, and I recommend that the request be granted.

I refer to you a communication from the Hon. Geo. B. Loring, Commissioner of Agriculture, who asks that the University be represented at conventions called by him at the Department of Agriculture, in Washington, in January next.

I respectfully report that under your authority the Faculty have reappointed Prof. J. C. Feitshans, of Springfield, to be instructor in elocution, and Mrs. Abbie Wilkinson, late of Rantoul, to be instructor in music, for the year now current. Both of these instructors to be paid, as heretofore, by the fees derived from their respective classes.

I again ask your attention to the need of assistance in the School of Mechanical Engineering.

A proposition from the Hon. C. B. Smith, in reference to some work which he desires to have done at the machine shops, was referred at your last meeting to a committee. Judge Smith has not brought the subject forward in such a way that it can be presented to you for action, and I suggest that the reference be continued until the next meeting.

Near the close of last term a few of our students appeared with badges of a newly organized college secret society. Well acquainted as I am with the workings of such societies in the older colleges, familiar with their best and worst phases, I believe that their naturalization in this University would be harmful, and that once having taken root, it would be nearly impossible to eradicate them. My predecessor, Dr. Gregory, discussed this question very fully in his communications to this Board, which then expressed a very decided opinion against the societies, but made no order as to the course of action to be adopted in the premises. The advice which was suggested did not produce any effect and the societies continued for some time, but having no affiliation with societies in other colleges, died after a time, when a number of its active men left the University. The case is now different, and if action is to be taken, it should be taken now.

Professor Burrill asks for $50 for purchase of seeds and flower pots for use of green house. He also asks extension of time nominating a man for Horticultural work. At this season of the year no harm can come from the delay.

I present the requests of Professors Pickard and Roos for increase of salaries.

S. H. PEABODY, *Regent.*

September 13, 1881.

After hearing the report the Board adjourned to 7:30 P. M.

EVENING SESSION.

The Board assembled on time; present as before.

The following appropriations and assignments of funds were made:

For painting woodwork in mechanical shop	$100 00
For fence in front of main building	500 00
For case for agricultural lecture room	150 00
For improvements of walks and drives	100 00
For extension of library cases	800 00
For books and publications	1,000 00
For collection of fossils, freight, etc	350 00
For microscope and objectives	450 00
For flower pots and seeds	50 00
For acoustic apparatus	150 00
For construction of milling machine	175 00
For construction of rifle range	100 00

It was voted that the State appropriation for current expenses ($5,700) be used for salaries, and that the Business Agent is directed to arrange the payments and vouchers.

The photographs of the University left at the Philadelphia Exhibition, were donated to the Teachers' Association of that city.

The Regent, the President of the Board and Prof. Morrow were appointed delegates to the convention at Washington, they to appoint one of their number to read a paper.

Adjourned to 9 o'clock A. M.

SECOND DAY'S SESSION.

The Board met at 9:50 o'clock A. M. Present as before.

The committee on a communication from Judge Smith, in regard to the manufacture of a certain article in the University shops, was continued.

Professors Weber and Scovell's report on Sorghum experiments was received, and referred to the Regent, Recording Secretary and Executive Committee, with direction to have it published in such form as deemed desirable.

The following preamble and resolutions were adopted:

WHEREAS, the Board of Trustees have heretofore, by their action in the premises relative to secret organizations, expressed the opinion that they are of a doubtful utility, and may be the source of much injury, we deem it best to reaffirm the former action of the Board; therefore, be it

Resolved, That the Board of Trustees deem the organization and existence of secret societies among the under-graduates of the University unwise, and detrimental to the best interests of the institution.

Resolved, That the Regent and Faculty be and they are hereby directed to take such measures as may be needful to secure the abandonment of such societies, if any exist, now or hereafter.

The report of the Business Agent was received and placed on file.

Statement of Current Appropriations and Receipts, August 31, 1881.

	Appropri't'd	Received.	Expended.	Balance.
Board expense	$300 00		$159 15	$140 85
Salaries	13,110 00		13,067 97	42 03
Fuel and light	1,000 00	$65 86	1,121 92	
Stationery and printing	400 00	185 00	593 55	
Buildings and grounds	100 00	76 75	160 31	16 44
Fixtures and furniture	100 00		27 14	72 86
Military department	50 00		83 95	
Library and apparatus	100 00	60	8 90	91 70
Incidental expenses	200 00		186 96	13 04
Mechanical department	127 33	812 53	885 07	54 79
Architectural "	463 54	2,993 63	3,735 84	
Agricultural "	5,989 49	3,054 21	4,333 30	4,710 40
Horticultural "	20 63	727 16	395 67	352 12
Chemical "	170 95	650 00	680 33	140 62
Sundries—Physical laboratory	60 72		25 83	34 89
Civil Engineering department	37 00		30 55	6 45
" " Printing	10 00			10 00
Examining schools	50 00		7 57	42 43
Springfield exhibition	150 00		110 84	39 16
Connecting signal station	25 00			25 00
Cabinets	6 90	4 45	14 08	
Sorghum experiments	180 00		185 00	
Students' government	25 00		7 25	17 75
Premium on bonds	700 00		700 00	
Students' fees		2,306 25		
Tuition Preparatory department		502 42	605 00	
I. C. R. R. freight donation		573 35		

Statement of State Appropriations, August 31, 1881.

	Appropri't'd	Received.	Expended.	Balance.
Taxes on lands	$5 000 00	$2,310 37	$2,310 37	
Buildings and grounds	5,000 00	2,500 00	1,006 03	$1,493 97
Chemical, Phys. and Bot. laboratories.	1,600 00	800 00	3 22	796 78
Mechanical and architectural shops	3,000 00	1,500 00	100 00	1,400 00
Books and publications	3,000 00	1,500 00	5 50	1,494 50
Library cases	800 00	800 00		800 00
Cabinets	1,000 00	1,000 00	88 46	911 54
Current expense	11,400 00	5,700 00		5,700 00
Engineering instruments	1,000 00	1,000 00	657 45	342 55
Furniture	1,000 00	1,000 00	707 10	292 90
Boiler house	5,000 00	5,000 00	1,925 41	3,074 59
Heating and ventilation	2,500 00	2,500 00	2,022 26	477 74
Farm college and dairy	1,000 00	1,000 00	771 66	228 34

The following appropriations for the six months ending February 28, 1882, were made:

Board expense		$300 00
Salaries		11,820 00
Fuel and lights	$2,800 00	
Stationery and printing	500 00	
Buildings and grounds	50 00	
Fixtures and furniture	50 00	
Military department	150 00	
Library and apparatus	50 00	
Incidental expense	200 00	
		3,800 00
Mechanical Department, Balance	$54 79	
Agricultural " "	1,710 40	
Horticultural " "	352 12	
Chemical " "	140 62	
		2,257 93
Sundries, Physical Laboratory	$34 89	
" Students' Government	17 75	
" Engineering College	16 45	
" Examining Schools	42 43	
		111 52
Total		$18,289 45

It was voted, that $3,000 be transferred from the credit of the Agricultural Department to the general fund.

It was voted, that the requests of Professors Pickard and Roos for increase of salary be not granted.

Messrs. McLean and Scott were appointed a committee to audit vouchers submitted and report at the next meeting.

The Treasurer presented his report which was received and placed on file.

ILLINOIS INDUSTRIAL UNIVERSITY,

To JOHN W. BUNN, *Treasurer.*

1881.	CR.		
June 8	By interest on Menard county bonds		$700 00
June 15	" interest on Morgan county bonds		2,000 00
July 1	" interest on Champaign county bonds		4,600 00
	" interest on Pike county bonds		2,100 00
	" interest on Sangamon county bonds		880 00
	" interest on Chicago Water bonds		875 00
	" interest on Kankakee School bonds		300 00
	" amount received from State—		
	for taxes on lands	$2,310 37	
	current repairs and improvements	2,500 00	
	expense for Laboratories	800 00	
	expense for Mechanical shops	1,500 00	
	books and binding for Library	1,500 00	
	library cases	800 00	
	specimens for museum	1,000 00	
	current expenses	5,700 00	
	instruments in Civil Engineering	1,000 00	
	furniture for main building	1,000 00	
	boiler house	5,000 00	
	boiler, steam pipes, etc	2,500 00	
	farm cottage and dairy	1,000 00	
			26,610 37
August 31	By amount received on acc't Mechanical Department	$544 35	
	" amount received on acc't Architectural Dep't	2,839 08	
	" amount received on acc't Agricultural Dep't	1,854 83	
	" amount received on acc't Horticultural Dep't	334 55	
	" amount received on acc't Chemical Department	250 00	
	" amount received on acc't light and fuel	35 40	
	" amount received on acc't stationery and printing	70 00	
	" amount received on acc't cabinets	4 45	
	" amount received on acc't fees	56 25	
	" amount received on acc't Illinois Central R. R.	397 60	
			6,386 51
			$44,451 88
	DR.		
1881.			
June 8	To balance		$316 83
August 31	" amount paid salaries	$6,300 11	
	" amount paid Board expense	128 05	
	" amount paid buildings and grounds	116 50	
	" amount paid fuel and lights	371 45	
	" amount paid stationery and printing	157 47	
	" amount paid furniture and fixtures	17 65	
	" amount paid Mechanical department	522 91	
	" amount paid Architectural department	3,212 53	
	" amount paid Agricultural department	2,156 75	
	" amount paid Horticultural department	236 18	
	" amount paid Chemical department	398 80	
	" amount paid Military department	35 80	
	" amount paid Library and apparatus	2 25	
	" amount paid incidental expenses	162 29	
			13,818 74
	" amount paid sugar experiments	$185 08	
	" amount paid Springfield exhibition	110 84	
	" amount paid premium on Morgan County bonds	700 00	
	" amount paid Preparatory department	130 00	
	" amount paid college government	7 25	
	" amount paid Physical laboratory	6 57	
	" amount paid Civil Engineering	20 85	
	" amount paid cabinets	3 75	
			1,164 34
	" amount paid buildings and grounds	$1,107 21	
	" amount paid books and publications	205 26	
	" amount paid cabinets	249 67	
	" amount paid Mechanical and Architectural shops	150 00	
	" amount paid Engineering instruments	657 45	
	" amount paid Laboratories	193 13	
	" amount paid heating and ventilation	2,022 26	
	" amount paid farm cottage and dairy	771 66	
	" amount paid furniture	707 10	
	" amount paid boiler house	1,925 41	
			7,989 45
	" balance		21,162 52
			$44,451 88

URBANA, ILL., September 13th, 1881.

JOHN W. BUNN, *Treasurer.*

It was voted that Cecil H. Peabody be engaged as Assistant Professor of Mechanical Engineering and Physics, at a salary of $90 per month for ten months, to begin September 1, 1881.

The following resolution, by Mr. Millard, was adopted:

Resolved, That the Regent and President of the Board be and they are hereby authorized to employ such person or persons as they may deem advisable, to correspond for and in the interest of the University with the press of the State: that the Faculty be, and they are hereby requested, to prepare and furnish such correspondent with a report of all experiments and matters of public interest pertaining to the University.

Resolved, That a sum not exceeding $200 be appropriated for such purpose.

In regard to a request from Mrs. Larned and Miss Sickles, the Secretary was instructed to inform the petitioners that it is deemed inexpedient to re-establish the School of Domestic Science.

Mr. McLean offered the following resolution, which was adopted:

Resolved. That the heads of the several departments of the University shall hereafter make full and detailed statements of all sums of money expended by them in their several departments, under direction and by authority of the Board of Trustees, setting forth to whom and for what purpose the same has been expended; and that regular pay-rolls shall be made out, showing the number of days' labor and amount per diem, together with the receipts of such sums of money for labor so expended, duly signed by the persons so named in said pay-roll.

Adjourned.

EMORY COBB, *President.*

E. SNYDER, *Secretary.*

List of Vouchers for Three Months ending Nov. 30, 1880.

No.	To whom.	For what.	Amount.
1	Alexander McLean	Expenses to Board Meeting	$26 00
2	Emory Cobb	" " "	13 70
3	T. T. Fountain	" to examine lands in Minnesota	170 00
4	S. M. Millard	" to " " "	145 00
5	A. L. Ide	Radiators	96 60
6	Blymer Manufacturing Co	Mill and evaporator	148 50
7	George A. Wild	Taxidermist tools	11 25
8	Wm. Price	Calsomining	66 00
9	S. H. Peabody	Salary, September, 1880	166 66
10	T. J. Burrill	" "	150 00
11	S. W. Shattuck	" "	150 00
12	E. Snyder	" "	150 00
13	D. C. Taft	" "	150 00
14	J. C. Pickard	" "	150 00
15	N. C. Ricker	" "	150 00
16	J. D. Crawford	" "	150 00
17	H. A. Weber	" "	150 00
18	G. E. Morrow	" "	150 00
19	F. W. Prentice	" "	100 00
20	P. Ross	" "	100 00
21	W. T. Wood	" "	30 00
22	I. O. Baker	" "	100 00
23	M. O. Scovell	" "	83 33
24	C. I. Hays	" "	75 00
25	C. E. Pickard	" "	90 00
26	E. L. Lawrence	" "	83 33
27	E. A. Kimball	" "	100 00
28	H. M. Beardsley	" "	40 00
29	Jerome Sondericker	" "	40 00
30	N. S. Spencer	" "	40 00
31	C. C. Barnes	" "	15 00
32	A. B. Baker	" "	50 00
33	J. G. Allison	" "	20 00
34	Architectural Department	Cabinet cases	529 70
35	A. B. Seymour	Collections for cabinets	18 15
36	I. I. McAllister	Carriage	16 50

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
37	Agricultural Department	Farm expenses, September, 1880	$248 53
38	Champaign Gas Co	Gas, July to October, 1880	49 20
39	Students' Labor Pay-roll	September, 1880	204 38
40	S. H. Peabody	Salary, October, 1880	166 66
41	T. J. Burrill	" "	150 00
42	S. W. Shattuck	" "	150 00
43	E. Snyder	" "	150 00
44	D. C. Taft	" "	150 00
45	J. C. Pickard	" "	150 00
46	N. C. Ricker	" "	150 00
47	J. D. Crawford	" "	150 00
48	H. A. Weber	" "	150 00
49	G. E. Morrow	" "	150 00
50	F. W. Prentice	" "	100 00
51	P. Roos	" "	100 00
52	W. T. Wood	" "	30 00
53	I. O. Baker	" "	100 00
54	M. A. Scovell	" "	83 33
55	C. I. Hays	" "	75 00
56	C. E. Pickard	" "	90 00
57	E. L. Lawrence	" "	83 33
58	E. A. Kimball	" "	100 00
59	H. M. Beardsley	" "	40 00
60	Jerome Sondericker	" "	40 00
61	N. S. Spencer	" "	40 00
62	C. C. Barnes	" "	15 00
63	A. B. Baker	" "	50 00
64	J. G. Allison	" "	20 00
65	J. D. Crawford	Books	4 25
66	H. Peddicord	Lime	1 60
67	Demuth Bros	Eyes (cabinets)	1 60
68	Zell, Swabacher & Co	Alcohol	18 80
69	Richard Cox	Digging cistern	10 00
70	J. C. Lewis	Mason work	23 37
71	J. H. W. Collins	Whitewashing	6 00
72	Field, Lieter & Co	Matting	11 75
73	John S. Slott	Stationery	20 10
74	James W. Queen & Co	Apparatus	36 75
75	Saginaw Lumber Yard	Lumber	28 00
76	L. R. Strassberger	Surveyor's chain and pins	10 25
77	Starr Coal Mining Co	Six cars coal	80 50
78	Carl Seiler	Apparatus	15 00
79	G. W. Parker	Work	26 00
80	J. M. W. Jones	Letter paper	6 50
81	Enterprise Coal Mining Co	Seven cars coal	88 90
82	Editors "Sanitarian"	Subscription, 1880	3 00
83	R. B. Harmel	Painting	78 88
84	Henry & Kariher	Sundries	4 70
85	J. R. Hussey	Map of Illinois	10 00
86	Fuller & Fuller	Glass	13 55
87	George Burton	9½ yards sand	9 50
88	J. Bacon	Coal	8 50
89	Illini	Stationery and printing	6 20
90	J. W. Schuck	Ventilating flues	93 00
91	Elmer & Amend	Chemicals	526 91
92	H. D. Chapin	Books	15 00
93	J. F. Wollensak	Locks	23 59
94	Brown & Holdoway	Books	5 50
95	C. B. Rogers	Work	6 25
96	J. Sondericker	Drawing map	1 50
97	J. B. Shannon	Hardware	7 36
98	Agricultural Department	Farm exp., October, 1880	299 26
99	United States Patent office	Binding	15 60
100	Yeomans, Shedd & Lesure	10 lbs tannate of soda	3 00
101	Champaign Gas Co	Lights, October, 1880	70 80
102	J. C. Vaughan	Sundries	3 35
103	A. N. Bannard	Tubs, jars, etc	10 50
104	Am. Soc. Civ. Eng	Transactions for 1880	15 00
105	American Journal of Science	4 volumes	8 00
106	Geo. W. Parker	Carpenter work	42 00
107	Robinson & Burr	Blacksmith work	18 57
108	Robinson & Burr	" "	4 85
109	Sutton & Sheldon	6 M brick	44 75
110	Jansen, McClurg & Co	Books	111 07
111	S. W. Shattuck	Student pay roll, October, 1880	211 43
112	Larrabee & North	Hardware	18 30
113	Larrabee & North	"	42 31
114	S. H. Peabody	Salary, November, 1880	166 66

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
115	T. J. Burrill	Salary, November, 1880	$150 00
116	S. W. Shattuck	" "	150 00
117	E. Snyder	" "	150 00
118	D. C. Taft	" "	150 00
119	J. C. Pickard	" "	150 00
120	N. C. Ricker	" "	150 00
121	J. D. Crawford	" "	150 00
122	H. A. Weber	" "	150 00
123	G. E. Morrow	" "	150 00
124	F. W. Prentice	" "	100 00
125	P. Roos	" "	100 00
126	W. T. Wood	" "	30 00
127	I. O. Baker	" "	100 00
128	M. A. Scovell	" "	83 33
129	C. I. Hays	" "	75 00
130	C. E. Pickard	" "	90 00
131	E. L. Lawrence	" "	83 33
132	E. A. Kimball	" "	100 00
133	H. M. Beardsley	" "	40 00
134	J. Soudericker	" "	40 00
135	N. S. Spencer	" "	40 00
136	C. C. Barnes	" "	15 00
137	J. G. Allison	" "	20 00
138	A. B. Baker	" "	50 00
139	Leggo Bros. & Co	Lithography	15 50
140	Enterprise Coal Co	5 cars coal	66 70
141	I. A. Hedges	Centrifugal mill	49 50
142	C. F. Columbia	2 hogs	24 00
143	J. H. W. Collins	Firing, Nov. 1880	30 00
144	Ritchie & Duck	Mailing tubes	3 00
145	N. A. Williams	Pipe and castings	12 55
146	Illinois Central Railroad	Advanced freights	7 76
147	I. B. and W. Ry	Freights	15 70
148	Isaac Grove	One calf	3 00
149	Agricultural Department	Farm expenses, Nov. 1880	206 94
150	Peter Henderson	Flower seeds	3 00
151	Jansen, McClurg & Co	Books	163 25
152	J. S. Thornton	One Jersey calf	15 00
153	H. Swannell	Chemicals	38 88
154	Champaign Gazette	Printing and advertising	45 90
155	The Illini	" " "	20 16
156	National Journal of Education	Advertising	37 50
157	F. W. Christien	Books, etc	3 60
158	J. E. Saxton & Co	Papers and wrappers	6 65
159	J. B. Weeks	Hauling	8 00
160	Star Mining Co	4 cars coal	50 60
161	Luddington, Wells, Van Shaik & Co	Lumber	260 33
162	Larrabee & North	Hardware and weather strips	18 76
163	American Journal of Mathematics	Subscription	5 00
164	Gussie E. Butts	Work in Herbarium	6 00
165	A. S. Clark	Books	1 77
166	A. E. Foote	"	5 00
167	Eimer & Amend	Chemical balance	94 60
168	Agricultural Department	Work on grounds	21 40
169	Horticultural Department	160 Norway spruce, etc	16 00
170	Agricultural Department	Work and hauling	159 50
171	H. A. Moore	Hardware and plumbing	13 35
172	J. C. Lewis	Mason work	19 00
173	Champaign Gas Co	Gas for Nov., 1880	108 60
174	Trevett & Green	Hardware	32 03
175	E. N. McAllister	Postage, Sept., Oct. and Nov	27 84
176	W. A. Moore & Co	Plumbing	13 00
177	Crane Bros. Manufacturing Co	Apparatus	5 20
178	Crane Bros. Manufacturing Co	Pipe	10 68
179	Crane Bros. Manufacturing Co	Tools and materials	60 05
180	Crane Bros. Manufacturing Co	Pipe and materials	175 36
181	S. W. Shattuck	Students' pay roll, Nov., 1880	184 86
182	Illinois Central Railroad	Freights, Aug., Sept., Oct. and Nov.	675 10
183	S. W. Shattuck	Petty expenses, 3 months	40 42
184	Architectural Department	Work for departments	65 42
185	Architectural Department	Work for State app's	301 10
186	Mechanical Department	Work for departments	108 81
187	Mechanical Department	Work for State app's	186 76
188	Wm. Price	Painting	110 98

List of Vouchers for Three Months ending Feb. 28, 1881.

No.	To whom.	For what.	Amount.
189	R. B. Mason	Expense to meeting	$4 00
190	Alex. McLean	" "	24 35
191	D. Gardner	Examining lands in Nebraska, etc	116 65
192	S. M. Millard	Expense to meeting	22 00
193	Mrs. M. A. Scovell	Salary full term, '80	60 00
194	Jennie C. Mahan	" "	12 50
195	J. E. Armstrong	Work in Museum	10 75
196	G. W. Parker	Labor in shops	59 10
197	Clark Rush	" "	113 00
198	Crane Bro's. Manufacturing Co	Pipes and valves	37 15
199	S. H. Peabody	Salary, December, 1880	166 66
200	T. J. Burrill	" "	150 00
201	S. W. Shattuck	" "	150 00
202	E. Snyder	" "	150 00
203	D. C. Taft	" "	150 00
204	J. C. Pickard	" "	150 00
205	N. C. Ricker	" "	150 00
206	J. D. Crawford	" "	150 00
207	H. A. Weber	" "	150 00
208	G. E. Morrow	" "	150 00
209	F. W. Prentice	" "	100 00
210	. Roos	" "	100 00
211	W. T. Wood	" "	30 00
212	I. O. Baker	" "	100 00
213	M. A. Scovell	" "	83 33
214	C. I. Hayes	" "	75 00
215	C. E. Pickard	" "	90 00
216	E. L. Lawrence	" "	83 33
217	E. A. Kimball	" "	100 00
218	H. M. Beardsley	" "	40 00
219	J. Sondericker	" "	40 00
220	N. S. Spencer	" "	40 00
221	C. C. Barnes	" "	15 00
222	J. G. Allison	" "	20 00
223	A. B. Baker	" "	50 00
224	Chemical Department	Apparatus	245 60
225	J. C. Lewis	Mason work	13 02
226	Mechanical Department	Pipe and fittings	61 06
227	Ritchie & Sons	Phys. apparatus	173 53
228	Dorflinger Glass Co.	Jars and bottles	62 61
229	Agricultural Department	Farm expense December, 1880	107 10
230	E. L. Lawrence	Boarding farm hands	14 57
231	B. F. Harrison	Hardware	11 50
232	Sedgwick Bros.	Wire	2 68
233	N. A. Williams	1 barrel cement	4 50
234	I. O. Baker	Binders	1 50
235	I. I. McAllister	Teaming	9 50
236	Fuller & Fuller	Glass	54 18
237	Alexander McLean	Expenses examining University lands	89 56
238	W. Raysdon	Hauling	5 00
239	E. L. Lawrence	Salary, January and February, 1881	166 67
240	Thos. Naughton	Collodion	1 50
241	Henry Horn	5 cars coal	117 00
242	H. A. Weber	Expense to Springfield	7 35
243	Hutchinson & Jones	11 steers	436 50
244	W. B. Carman	Leading choir	12 50
245	J. S. Miller	Stove pipe	1 50
246	J. G. Clark	2 pigs	20 00
247	Champaign Gas Company	Lights, December, '80	101 10
248	S. H. Peabody	Expenses Springfield exhibition	87 15
249	Thos. Wright	Castings	18 98
250	Walker & Mulliken	Webbing, dusters, etc	9 70
251	New England Sub Agency	Books and publications	200 07
252	Peterson & Lloyd	Sundries	4 00
253	A. Barr	Lumber	7 57
254	Fred L. Hill	Music	5 00
255	J. H. W. Collins	Firing	25 00
256	R. B. Harmel	Painting	30 00
257	S. H. Peabody	Salary, January, 1881	166 66
258	T. J. Burrill	" "	150 00
259	S. W. Shattuck	" "	150 00
260	E. Snyder	" "	150 00
261	D. C. Taft	" "	150 00
262	J. C. Pickard	" "	150 00
263	N. C. Ricker	" "	150 00
264	J. D. Crawford	" "	150 00
265	H. A. Weber	" "	150 00
266	F. W. Prentice	" "	100 00

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
267	P. Roos	Salary, January, 1881	$100 00
268	W. T. Wood	" "	30 00
269	I. O. Baker	" "	100 00
270	M. A. Scovell	" "	83 33
271	C. I. Hays	" "	75 00
272	C. E. Pickard	" "	90 00
273	E. A. Kimball	" "	100 00
274	H. M. Beardsley	" "	40 00
275	J. Sondericker	" "	40 00
276	N. S. Spencer	" "	40 00
277	C. C. Barnes	" "	15 00
278	A. B. Baker	" "	50 00
279	Chicago Linseed Oil Co	23 sacks meal	23 00
280	Prof. G. E. Morrow	Salary, January, 1881	150 00
281	Students' labor pay roll	December, 1880	206 10
282	Robinson & Burr	Work on pipes	99 02
283	J. C. Lewis	Mason work	11 35
284	Fuller & Fuller	Alcohol and machine oil	31 29
285	Western Educational Journal	Advertising	3 50
286	D. Appleton & Co	Index to American Cyclopedia	4 00
287	William Sim	Paint for blackboard	13 80
288	J. M. Clark	Carpenter work	20 00
289	Illini	Printing catalogues	28 00
290	G. W. Parker	Work in Mechanical Department	39 10
291	J. H. W. Collins	Fireman's salary	31 00
292	Belcher Sugar Refining Co	117 pounds bone black	3 70
293	Agricultural Department	Farm expenses for January	123 78
294	Star Coal Mining Co	5 cars coal	192 50
295	Mrs. M. A. Scovell	Teaching Janary, '81	20 00
296	Eimer & Amend	Chemicals and apparatus	68 86
297	Enterprise Coal & Coke Co	10 cars coal	308 85
298	Massachusetts Historical Society	Book	2 50
299	S. A. Bullard	Work on exhibition, Springfield	15 00
300	Springfield Daily Journal	Subscription	4 00
301	David G. Francis	Books	3 00
302	Champaign Gas Co	Lights, January, 1881	102 90
303	Miller & Hunt	Flower seed	6 00
304	Eichberg Bros	Carding	2 00
305	A. B. Baker	Expenses in cleaning	31 25
306	Illini	Printing circulars	21 75
307	S. M. Marble	Bran	15 82
308	J. C. Lewis	Mason work and finishing	27 75
309	J. Skinner	Shoveling coal	10 39
310	Students' labor pay roll	January, 1881	181 99
311	S. H. Peabody	Salary, February 1881	166 66
312	T. J. Burrill	" "	150 00
313	S. W. Shattuck	" "	150 00
314	E. Snyder	" "	150 00
315	D. C. Taft	" "	150 00
316	J. C. Pickard	" "	150 00
317	N. C. Ricker	" "	150 00
318	J. D. Crawford	" "	150 00
319	H. A. Weber	" "	150 00
320	G. E. Morrow	" "	150 00
321	F. W. Prentice	" "	100 00
322	P. Roos	" "	100 00
323	W. T. Wood	" "	30 00
324	J. O. Baker	" "	100 00
325	M. A. Scovell	" "	83 33
326	C. I. Hays	" "	75 00
327	C. E. Pickard	" "	90 00
328	E. A. Kimball	" "	100 00
329	H. M. Beardsley	" "	40 00
330	J. Sondericker	" "	40 00
331	N. S. Spencer	" "	40 00
332	C. C. Barnes	" "	15 00
333	A. B. Baker	" "	50 00
334	A. B. Baker	Petty expenses	6 27
335	S. W. Shattuck	Salary as Business Agent, 6 months	100 00
336	Illini	Printing	18 41
337	T. J. Burrill	Expense for biennial report	10 75
338	Yeomans, Shedd & Lesure	20 lbs. tannate soda	3 00
339	Plant Sugar Co	Hemp seed	3 95
340	I. B. and W. Railway	Freights	6 35
341	Trevett & Green	Pipes and repairs	71 76
342	M. A. Barnes	5 days' work	6 25
343	H. Swannell	Chemicals	8 69
344	Trevett & Green	Hardware	41 87

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
345	S. H. Peabody	Incidental expenses	$34 08
346	Peter Henderson	Flower seeds	3 00
347	Miller & Hunt	Flower pots	26 00
348	G. E. Morrow	Expense Agricultural Institute	13 00
349	Agricultural Department	Farm expenses, February, 1881	169 25
350	J. H. W. Collins	Fireman's wages, February	25 00
351	Mrs. M. A. Scovell	Teaching calisthenics—February	20 00
352	W. T. Pratt	Roof repairs	6 90
353	J. M. Clark	Work in shops	13 10
354	J. S. Thornton	One yearling filly	40 00
355	Crane Bros. Mfg. Co	Hardware and coal	130 92
356	Crane Bros. Mfg. Co	Pipe and fittings	76 05
357	Champaign Gazette	Printing and advertising	29 15
358	B. F. Wingard	Clock and cord	2 85
359	Mrs. C. E. Maltby	Service, as organist 3 months	12 50
360	W. B. Carman	Leading choir 3 months	12 50
361	Students' labor pay-roll	February, 1881	131 82
362	Agricultural Department	Work for other departments	124 90
363	J. E. Armstrong	Instruction 3 months	36 00
364	Lyon & Healey	Base drum	8 64
365	J. C. Lewis	Night firing, etc	4 50
366	E. N. McAllister	Postage, 3 months	32 50
367	S. W. Shattuck	Petty expenses, 3 months	57 34
368	Agricultural department	Work for State app	124 76
369	Architectural "	" departments	232 99
370	Mechanical "	" "	235 06
371	Mechanical "	" State apps	266 89
372	Horticultural "	" " "	27 87
373	I. C. R. R. donation	Freights, 3 months	951 15
374	I. C. R. R.	Advanced freights	30 46

List of Vouchers for Three Months ending May 31, 1881.

No.	To whom.	For what.	Amount.
375	Champaign Gas Co	Lights, February, 1881	$122 70
376	J. M. Clark	Carpenter work	18 05
377	T. T. Fountain	Expense, etc., March meeting	20 00
378	D. Appleton & Co	Books	26 00
379	R. B. Mason	Expense, etc., March meeting	4 00
380	Houghton, Mifflin & Co.	Books	5 40
381	Eimer & Amend	Muffles and crucibles	11 98
382	S. H. Peabody	Salary, March 1 to March 8	43 00
383	S. H. Peabody	" March 9 to date	185 38
384	T. J. Burrill	" March, 1881	150 00
385	S. W. Shattuck	" "	150 00
386	E. Snyder	" "	150 00
387	D. C. Taft	" "	150 00
388	J. C. Pickard	" "	150 00
389	N. C. Ricker	" "	150 00
390	J. D. Crawford	" "	150 00
391	H. A. Weber	" "	150 00
392	G. E. Morrow	" "	150 00
393	F. W. Prentice	" "	100 00
394	W. T. Wood	" "	30 00
395	P. Roos	" "	100 00
396	J. O. Baker	" "	100 00
397	M. A. Scovell	" "	83 33
398	C. I. Hays	" "	75 00
399	C. E. Pickard	" "	90 00
400	E. A. Kimball	" "	100 00
401	H. M. Beardsley	" "	40 00
402	J. Sondericker	" "	40 00
403	N. S. Spencer	" "	40 00
404	C. C. Barnes	" "	15 00
405	A. B. Baker	" "	50 00
406	Enterprise Coal Co	Seven cars coal	165 30
407	Henry Horn	Coal	117 25
408	James W. Queen & Co	Galvanometer	20 30
409	"Illini"	Printing	8 50
410	Darling, Brown & Sharp	Apparatus and tools	16 10
411	A. N. Talbot	Salary, winter term	18 25
412	Eimer & Amend	Chemicals	141 00
413	Crane Bros'. Manufacturing Co	13 tons hard coal	88 90
414	B. A. Slade	Salary, winter term	18 25

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
415	Fuller & Fuller	Chemicals	$38 66
416	Western Educational Journal	Advertising	3 50
417	Jansen, McClurg & Co	Books	71 32
418	Fuller & Fuller	Glass	67 73
419	Carl Schoenhof	Books	94 68
420	L. B. and W. Ry	Freights	11 44
421	J. Morrissey	Work on heating apparatus	60 60
422	J. B. Weeks	Drayage	7 10
423	J. F. Wollensak	Keys	1 50
424	J. H. W. Collins	Firing	29 00
425	Thomas Wright	Castings	10 19
426	John Steedman	One bay mare	115 00
427	J. Binckshaw & Co	Coal	22 50
428	W. T. Keener	Book	2 24
429	J. E. Saxton & Co	Stationery	6 95
430	A. T. Anderson	Burnishing swords	3 00
431	Students' labor pay roll	March, 1881	171 83
432	Agricultural Department	Farm expenses, March	150 52
433	S. H. Peabody	Salary, April, 1881	250 00
434	T. J. Burrill	" " "	150 00
435	S. W. Shattuck	" " "	150 00
436	E. Snyder	" " "	150 00
437	D. C. Taft	" " "	150 00
438	J. C. Pickard	" " "	150 00
439	N. C. Ricker	" " "	150 00
440	J. D. Crawford	" " "	150 00
441	H. A. Weber	" " "	150 00
432	G. E. Morrow	" " "	150 00
443	F. W. Prentice	" " "	100 00
444	P. Roos	" " "	100 00
445	I. O. Baker	" " "	100 00
446	M. A. Scovell	" " "	83 33
447	C. E. Pickard	" " "	90 00
448	E. A. Kimball	" " "	100 00
449	H. W. Beardsley	" " "	40 00
450	J. Sondericker	" " "	40 00
451	N. S. Spencer	" " "	40 00
452	A. B. Baker	" " "	50 00
453	Eimer & Amend	" " "	125 10
454	R. S. Wilber	Hauling coal	27 00
455	S. H. Peabody	Petty expenses	20 64
456	Mrs. M. A. Scovell	Teaching calisthenics	15 00
457	E. B. Gregg	Work in shops	23 00
458	G. E. Hessel & Son	Belting	8 00
459	J. S. Bassett & Co	Gas fixtures	5 75
460	Sand Blast File Cutting Co	Files	3 05
461	T. C. Hill	Expense in gymnasium	8 95
462	Wm. Preston	Jersey calf	20 00
463	C. B. Dickens	1 grade Norman mare	155 00
464	C. J. Sabin	Grass seed and plows	40 45
465	R. B. Harmel	Painting	18 00
466	R. B. Harmel	Painting and calsomining	7 08
467	A. B. Seymour	Work on Herbarium	3 40
468	J. H. W. Collins	Firing	26 00
469	Geo. H. Klock	Two gates	60 00
470	J. F. Wollensak	Brackets	1 25
471	Fuller & Fuller	Glass and alcohol	24 93
472	Jno. S. Stott	Stationery	27 00
473	Beson & Co	Lime	1 25
474	Dennuth Bros	Artificial eyes	10 92
475	Larrabee & North	Hardware	44 70
476	F. Leypoldt	Library Journal	3 00
477	Enterprise Coal Co	3 cars coal	62 30
478	J. Binckshaw	Car of coal	15 00
479	Luddington, Wells & VanSchick Co	Lumber	155 00
480	Wm. Sim	Painting, etc	119 30
481	Agricultural Department	Farm expenses	563 69
482	Turett Bros	Hardware	42 10
483	Champaign Gas Co	Lights, April, 1881	97 20
484	Students' labor pay roll	April, 1881	209 81
485	S. H. Peabody	Salary, May, 1881	250 00
486	T. J. Burrill	" "	150 00
487	S. W. Shattuck	" "	150 00
488	E. Snyder	" "	150 00
489	D. C. Taft	" "	150 00
490	J. C. Pickard	" "	150 00
491	N. C. Ricker	" "	150 00
492	J. D. Crawford	" "	150 00
493	H. A. Weber	" "	150 00

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
494	G. E. Morrow	Salary, May, 1881	$150 00
495	F. W. Prentice	" "	100 01
496	P. Roos	" "	100 00
497	I. O. Baker	" "	100 00
498	M. A. Scovell	" "	83 33
499	C. E. Pickard	" "	90 00
500	E. A. Kimball	" "	100 00
501	H. M. Beardsley	Salary, May, 1881	40 00
502	J. Sondericker	" "	40 00
503	N. S. Spencer	" "	40 00
504	A. B. Baker	" "	50 00
505	Jno. C. Cannon	Advertising	10 00
506	J. H. W. Collins	Firing	25 00
507	Wm. Myers	Calsomining	6 50
508	Sutton & Sheldon	1,000 brick	8 00
509	Carl Schoenhof	Books	6 75
510	E. S. Ritchie & Sons	Physical apparatus	220 73
511	Darling, Brown & Sharp	Tools	18 00
512	Lyon & Healy	Band instruments	20 52
513	R. B. Harmel	Calsomining	16 95
514	Champaign Gazette	Printing	17 25
515	M. E. Lapham	Lumber	10 44
516	Chas. B. Johnson	Bottles and pipettes	9 93
517	T. J. Burrill	Trees, stock etc	27 49
518	Gauthiers-Villars	French books	33 42
519	Cushing, Toomas & Co	University catalogue 1881	241 90
520	W. C. Hannah	Moose and canibon	39 00
521	A. N. Talbot	Services in Physical Laboratory	18 75
522	B. A. Slade	" " "	18 75
523	Wm. B. Carman	Services leading choir	12 50
524	I. B. & W. Ry	Freights	6 73
525	D. C. Taft	Sundry expenses	10 20
526	A. W. Palmer	Book	1 25
527	Agricultural Department	Farm expense, May, 1881	407 33
528	James Harmison	Seeds	30 50
529	A. M. Coffeen	Wall paper	10 14
530	R. S. Wilber	Hauling	6 85
531	Wm. Leary	1 corn cultivator	18 00
532	F. W. Christien	Books and periodicals	97 29
533	Jansen, McClurg & Co	Books	33 63
534	Jacob Johnson	Spring wagon	62 50
535	Thos. Wright	Castings	4 04
536	Burnett & Co	Harness and whips	12 50
537	A. U. Bannard	Grass and other seeds	31 26
538	C. J. Sabin	Mower and pump	90 25
539	E. T. Myers	Labor on grounds	6 00
540	Bailey & Swannell	1000 bags ground oil cake	14 50
541	Western Bank Note Engraving Co	Diplomas	37 50
542	Jno. W. Bunn	Taxes on wild land	2,310 37
543	The Illini	Printing and advertising	25 68
544	Mechanical Department	Work for Departments	89 31
545	Mechanical Department	Work for State	115 42
546	Architectural Department	" " "	60 00
547	Horticultural Department	Trees	10 85
548	A. B. Seymour	Teaching Botany class	55 00
549	Crane Bro's. Manufacturing Co	Hardware	14 71
550	S. W. Shattuck	Students' Pay Roll, May	178 54
551	Crane Bro's. Manufacturing Co	Hardware	16 99
552	Trevett & Green	"	51 08
553	I. C. R. R.	Freights, March and April	175 75
554	I. O. Baker	Repairs on C. E. Insts	9 70
555	S. W. Shattuck	Petty expenses, March and May	50 15
556	E. N. McAllister	Postage three months	45 50
557	J. Sondericker	Lettering Diplomas	19 55
558	Lucy A. Hall	Services as organist	12 50
559	Thomas & Smith	1 Short Horn cow	230 00

List of Vouchers for three months ending August 31, 1881.

No.	To whom.	For what.	Amount.
560	J. W. Bunn	Premium on bonds	$700 00
561	E. T. Myers	Work, painting	3 50
562	G. Deuerlich	Books	67 50
563	Jno. S. Stott	Stationery	12 70
564	W. and L. E. Gurley	Plum and pins	1 85

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
565	S. H. Peabody	Petty expenses, etc	$27 12
566	A. M. Scott	Drain tile	49 38
567	S. M. Marble	Hauling coal	9 60
568	Jno. F. Gere	Police duty	12 50
569	A. E. Hann	Police duty	12 50
570	Champaign Gas Co	Gas, May, 1881	48 30
571	J. C. Vaughn	Seeds and bulbs	6 93
572	W. B. Braucher	Services as Marshal	5 25
573	H. M. Beardsley	Printing and postage	9 70
574	"Illini"	Printing	2 75
575	J. H. W. Collins	15 days' work	15 00
576	R. B. Harmel	Finishing cases	70 00
577	J. E. Armstrong	Cabinet work	14 00
578	Chas. Bennett	Expenses to June meeting	5 18
579	R. N. Paden	Expenses to June meeting	12 50
580	S. M. Millard	" June and March meeting	38 68
581	T. T. Fountain	" " " "	21 14
582	S. H. Peabody	Salary, June, 1881	250 00
583	T. J. Burrill	" "	150 00
584	S. W. Shattuck	" "	150 00
585	E. Snyder	" "	150 00
586	D. C. Taft	" "	150 00
587	J. C. Pickard	" "	150 00
588	W. C. Ricker	" "	150 00
589	J. D. Crawford	" "	150 00
590	H. A. Weber	" "	150 00
591	G. E. Morrow	" "	150 00
592	F. W. Prentice	" "	100 00
593	Peter Roos	" "	100 00
594	I. O. Baker	" "	100 00
595	M. A. Scovell	" "	83 33
596	C. E. Pickard	" "	90 00
597	E. A. Kimball	" "	100 00
598	H. M. Beardsley	" "	40 00
599	J. Sondericker	" "	40 00
600	A. B. Baker	" "	50 00
601	J. H. Hays and R. Bowman	Police duties	75 00
602	G. W. Ingalls	Photograph book	30 00
603	J. Burkett Webb	French books	50 00
604	Horticultural Department	Improvements on grounds	97 68
605	J. Burkett Webb	French books and publications	52 56
606	Troughton & Simms	Theodolite	657 45
607	N. A. Williams	Lime and cement	106 45
608	J. E. Woods	Black walnut	150 00
609	Palmer, Fuller & Co	Blinds	33 00
610	A. B. Davis	Sand	22 50
611	N. S. Spencer	Expenses to Springfield	38 84
612	Zell, Schwabacker & Co	Alcohol	18 60
613	Students' labor pay roll	June, 1881	432 30
614	G. E. Morrow	Farm expenses, June	461 43
615	Labor pay roll	Taking down Dormitory	324 83
616	S. H. Peabody	Salary, July, 1881	250 00
617	T. J. Burrill	" "	150 00
618	S. W. Shattuck	" "	150 00
619	E. Snyder	" "	150 00
620	D. C. Taft	" "	150 00
621	J. C. Pickard	" "	150 00
622	N. C. Ricker	" "	150 00
623	J. D. Crawford	" "	150 00
624	H. A. Weber	" "	150 00
625	G. E. Morrow	" "	150 00
626	F. W. Prentice	" "	100 00
627	P. Roos	" "	100 00
628	I. O. Baker	" "	100 00
629	M. A. Scovell	" "	83 33
630	E. A. Kimball	" "	100 00
631	A. B. Baker	" "	50 00
632	Geo. W. Davidson	Teaming	5 00
633	Robinson & Burr	Forging, etc	6 57
634	Robinson & Burr	Rods, etc	2 75
635	N. S. Spencer	Salary, June, 1881	73 75
636	M. W. Lacey	Hauling bricks, etc	31 75
637	R. and J. Beck	Microscope parts	12 00
638	Ebenezer Fryer	Stone work	235 20
639	R. and J. Beck	Microscopes, etc	169 20
640	Cameron Amberg Co	File cabinet case	26 20
641	Cameron Amberg Co	Stub files	3 38
642	J. N. Petree	Scraping, etc	26 25
643	C. and U. Gas Co	Gas, June, 1881	12 00

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
644	Sedgwick Bros	Wire fence, 50 rods	$59 38
645	The Tribune Co	Advertising	21 00
646	J. E. Saxton & Co	Stationery	11 75
647	Luddington, Wells & Van Schick	Lumber	278 05
648	Peter Cheffee	Stone cutting	7 50
649	Henry & Kariher	Pails, salt, etc	12 17
650	C. S. Sargent	Boxing wood specimens	2 50
651	R. B. Harmel	Painting	61 77
652	Thos. Kerr	Brick work on vet. stable	25 00
653	Thos. Kerr	" " farm cottage	67 47
654	N. Y. Graphic Co	Advertising	2 50
655	N. S. Spencer	Pay-roll of workmen	459 61
656	Chicago Lead and Oil Co	White lead and oil	121 28
657	Prairie Farmer	Advertising	12 00
658	Thos. Kerr	Brick-work on farm cottage	91 26
659	A. H. Andrews & Co	Settees and desk	404 00
660	J. McCulloch	Ency. Brit. vol. 12	5 50
661	J. H. W. Collins	Work on pipes	11 00
662	N. S. Spencer	Salary, July, 1881	79 00
663	Thos. Kerr	Brick work	40 22
664	Chicago Carpet Co	Carpet and shades	72 95
665	G. E. Morrow	Expenses of farm, July, 1881	237 49
666	Students' pay roll	July, 1881	583 71
667	Trevett Bros	Hardware	94 67
668	N. A. Williams	Lime and cement	111 40
669	A. B. Davis	Sand, 45 yards	45 00
670	S. H. Peabody	Salary, August, 1881	250 00
671	T. J. Burrill	" "	150 00
672	S. W. Shattuck	" "	150 00
673	E. Snyder	" "	150 00
674	D. C. Taft	" "	150 00
675	J. C. Pickard	" "	150 00
676	W. C. Ricker	" "	150 00
677	J. D. Crawford	" "	150 00
678	H. A. Weber	" "	150 00
679	G. E. Morrow	" "	150 00
680	F. W. Prentice	" "	100 00
681	P. Roos	" "	100 00
682	J. O. Baker	" "	100 00
683	M. A. Scovell	" "	83 33
684	E. A. Kimball	" "	100 00
685	A. B. Baker	" "	50 00
686	Abendroth & Root Manufact'ng Co	Tubes and gaskets	24 75
687	Louis Wilskry	Work on pipes	5 25
688	S. W. Shattuck	Salary, 6 months, Business Agent	100 00
689	J. C. Blackwell	Painting	2 00
690	Fuller & Fuller	Glass	26 30
691	Miller & Hunt	Plants	6 40
692	Belcher Sugar Refining Co	Bone-black	51 52
693	W. L. Pillsbury	Proof-reading	25 00
694	Central Telephone Co	Quarter's rental	15 00
695	M. A. Scovell	Sundry expenses	15 05
696	D. C. Taft	" "	3 15
697	Luddington, Wells & Van Schick	Lumber	346 47
698	Urbana Herald	Printing	12 50
699	Wm. Nash	2 dozen brooms	7 20
700	W. T. Pratt	Painting 18 days	36 00
701	A. H. Andrews	Crayons, slating, etc	46 30
702	A. B. Davis	Sand, 64½ yards	64 50
703	Thomas Kerr	Mason work	125 05
704	Enterprise Coal Co	95 tons coal	105 00
705	H. M. Wilmarth	Gas stove	4 50
706	R. B. Harmell	Painting blinds	3 50
707	Agricultural Department	Farm expenses, August	506 90
708	C. F. Adams	Specimens	71 50
709	Abendroth and Root Mfg. Co	Boiler and pipes	1,392 00
710	F. A. Taft	Paper trays	52 12
711	Chicago White Lead Co	White lead	47 39
712	R. B. Harmel	Painting	23 12
713	R. B. Harmel	" chairs	30 63
714	H. A. Weber	Expenses	25 06
715	Champaign County Gazette	Printing	15 00
716	Peterson & Lloyde	Stationery, etc	10 45
717	McCormick Harvester Co	Machine and wire	289 90
718	Chicago Carpet Co	Shade cloth, etc	11 50
719	J. S. Ford-Johnson Co	12 dozen chairs	102 50
720	Globe Printing Co	Advertising	16 24
721	John S. Stott	Stationery	23 63
722	Western Educational Journal	Advertising	3 50

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
723	Farmers' Review Co	Advertising	$9 00
724	Geo. W. Parker	Carpenter work	57 90
725	W., St. L. & P. R'y	Freights	6 89
726	Agricultural department	Work on grounds	43 32
727	Agricultural Department	Work for other departments	74 80
728	Crane Bros. Manufacturing Co	Pipe and fittings	209 97
729	Crane Bros. Manufacturing Co	Pipe and fittings, etc	41 06
730	American Express Co	Expressage	6 80
731	Trevett Bros	Hardware	3 30
732	Trevett Bros	"	5 83
733	Champaign Manufacturing Co	Well circles, etc	19 80
734	Samuel Bentley	Work	7 00
735	N. S. Spencer	Salary, August	67 50
736	Larrabee & North	Hardware	158 71
737	Samuel Bentley	Work	43 56
738	W. F. Pratt	Work on roofs	40 26
739	H. Swannell	Paints and varnish	10 83
740	H. Swannell	Paint brushes, etc	37 13
741	I. B. & W. Ry	Freight	69 58
742	Inter-Ocean Publishing Co	Advertising	28 00
743	A. B. Baker	Workwomen cleaning	171 40
744	H. Swannell	Chemicals, etc	320 39
745	J. H. W. Collins	Painting	28 00
746	N. S. Spencer	Pay roll, laborers	113 34
747	Trevett & Green	Hardware	100 61
748	Students' pay roll	August, 1881	574 70
749	E. N. McAllister	Postage 3 months	35 98
750	M. A. Scovell	Expenses	27 70
751	Illinois Central Railroad donation	Freight 3 months	397 60
752	Mechanical Department	Labor and material, 3 months	401 47
753	Mechanical Department	Labor and material, 3 months	88 90
754	S. W. Shattuck	Petty expenses, 3 months	81 36
755	F. A. Taft	Work on insect cabinet	7 68
756	Horticultural Department	Work on grounds, 3 months	73 75
757	Architectural Department	Labor and materials, 6 months	167 50
758	Architectural Department	Labor and materials, 6 months	1,914 09

BOARD MEETING, DECEMBER 13, 1881.

The Board assembled in the University parlor at 4 o'clock P. M. Present—Messrs. Bennett, Mason, McLean, Millard, Paden, Pearman and Scott. Absent—Governor Cullom, Messrs. Bird, Cobb and Fountain.

In absence of the President the Board was called to order by the Secretary, and Mr. Millard was elected chairman.

The records of last meeting were read and adopted.

The Regent read his report, which was received:

To the Trustees of the Illinois Industrial University.

GENTLEMEN: The term now drawing to a close has been marked by the usual order and industry which is the rule at this University. The peculiar character of the season and the consequent deficiency in the crops of Central and Southern Illinois, with the despondent feeling thus caused in the public mind, gave reasons for some apprehension as to the attendance of the present year. It was known before the opening of the term that some students would not return for this cause, and there was doubt lest the number of accessions should be reduced in like manner. The enrollment for this term is 319. For the same term last year 337. The difference, 18, is exactly the difference in the numbers of the Senior classes for the two years.

The roll by classes is as follows:

	Gentlemen.	Ladies.	Total.
Seniors	29	3	32
Juniors	32	15	47
Sophomores	50	20	70
Freshmen	75	21	96
	186	59	245
Preparatory	57	10	67
Special	6	1	7
	249	70	319

The report of subjects taught, with the numbers in attendance in each, is as follows:

	Classes.	Hours per day.	Men.	Women.	Total.
Mathematics	4	4	95	20	115
Engineering	3	6	33	.....	33
Agriculture	2	3	12	.....	12
Mechanical Science	2	3	13	.....	13
Mechanical Practice	1	2	6	.....	6
Architecture	4	6	13	.....	13
Architecture Practice	1	2	9	.....	9
Chemistry	3	6	69	17	86
Mineralogy	1	1	8	.....	8
Geology and Physical Geology	2	2	19	4	23
Veterinary Science	1	1	7	.....	7
Physiology	2	2	29	16	45
Botany	1	2	6	5	11
Mental Science	1	1	27	3	30
History	2	2	26	15	41
English Literature	4	4	47	37	84
German	3	3	28	67	95
French	2	2	19	59	78
Latin	2	2	7	4	11
Greek	3	3	10	4	14
Drawing, Mathematics	2	4	58	.....	58
Drawing and Painting	2	2	10	17	27
Military Science	2	1	17	.....	17
	50	64			
Preparatory Class—					
Physiology	2	2	31	4	35
Mathematics	2	2	51	7	58
Natural Philosophy	2	2	34	8	42
	6	6			

SECRET COLLEGE FRATERNITIES.

Immediately after the opening of the term, I notified privately members of the society then formed, of the action taken by you at your last meeting. I was assured that while the members regretted the necessity which seemed to be laid upon them, they had no desire to stand in opposition to the wishes of those in authority, and immediately the insignia of the society disappeared. In the belief that a kind and quiet course of action, if it should prove effectual, would be better than more open demonstration, nothing farther was done at that time. Later in the term it was ascertained that a committee from certain Indiana colleges was at this University for the purpose of organizing another society. Warning notice was at once given that such action was contrary to your wishes and could not be tolerated: but it appeared that the notice was not heeded, and the organization proceeded. It also transpired that the first society had only retired behind the curtain and were vigorously but secretly pushing their work and gathering recruits. It appeared that the time had come for immediate and decided action. Accordingly the Faculty passed and published the following orders, based upon the authority of the resolutions passed at your last meeting:

"That after the first day of January, 1882, no student may receive a class-card, or be admitted to any class in the Preparatory course or in the University, until he shall have deposited in the office of the Regent his pledge that he will not join or be connected with any college secret society so long as he shall be a student at this University.

That after the first day of January, 1882, no student may receive an honorable dismission, or certificate or diploma of graduation, unless he shall have first deposited in the office of the Regent a statement upon his honor that he has not since the date of his first pledge, given as above, been connected with any college secret society, as a member or otherwise."

This publication brought at once to the light a third society, whose existence here was not known to the Faculty, while it is intimated that a fourth, which gave much trouble during the administration of my predecessor, is yet alive or has been revived. The form of the orders are substantially those which are in use at the College of New Jersey, at Princeton, and are such as have been dictated by the experience of that and other institutions in their treatment of this parasitic evil during the last thirty years.

It is believed that nothing less explicit and decided will be of avail in securing the end desired. The student who means to obey a law prohibiting these societies will be willing to say so; one who has kept the faith will have no hesitation in declaring that fact. Only such as desire the opportunity for a mental reservation will be troubled by the precision with which the lines are drawn.

It was not expected that young men who were engaged in any project upon which they had in some degree set their affections, would give up that project at a word without protest. At the last meeting of the Faculty, a petition addressed to the Trustees and Faculty

was presented by a committee of three students, each representing a fraternity, in which petition they ask such a modification of the rule as shall permit these societies to exist among students of the Senior and Junior classes. The Faculty gave the committee respectful audience, and listened to the statements which the gentlemen made. The Faculty have requested me to transmit this petition to you, which I do herewith. They have carefully considered this with the other questions which have arisen in this connection, and they desire that I would present with the petition their opinion that it should not be granted. This they say upon the merits of the general question, and without calling in question in any way the good intentions of the young gentlemen concerned.

It is, indeed, always better to restrict an evil that cannot be removed entirely. It will be difficult, however, to satisfy the three lower classes, if they are prohibited from any privilege which the two upper classes may enjoy. It will create trouble, for the reason that as yet the lines between classes are not as in other colleges sharply drawn. Even if good faith is fully kept in the presence of the constant temptation to break it, and men in the lower classes are not elected or initiated before they become fully recognized Juniors, the men of those classes will be pledged to join soon after they come to reside here; they will be fretted continually by the rule which restrains them from that which they see others enjoy; and in all questions which concern the general interests of the University, in which for their own advancement the fraternities seek to control classes, societies, and the students' government, these brevet members will be forced to obey their leaders even more implicitly than if they were in full membership.

The right of the Trustees and Faculty to take the course they have pursued, has been lately the subject of legal inquiry in a case in which the President and Trustees of Purdue University, in Indiana, were made respondents to an application for a writ of mandamus in the Circuit Court. The decision of Judge Vinton was in favor of the government of the institution, and the writ was refused.

The Supreme Court of the State of Illinois, in the case of "The People vs. Wheaton College," has decided by a unanimous court a broader question, in which the principles which must govern this question must be fully settled.

Wheaton College had made a rule by which its students were forbidden to be members of any secret society. In violation of this rule, one of its studenis joined the Good Templars, and "was suspended from the privileges of the institution until he should express a purpose to conform to its rules." A writ of mandamus to compel admission was refused, first by the Circuit Court and afterward by the Supreme Court of the State.

The Court used this language:

"Whether the rule be judicious or not, it violates neither good morals nor the law of the land, and is therefore clearly within the power of the college authorities to make and enforce. A discretionary power has been given them to regulate the discipline of their college in such manner as they deem proper, and so long as their rules violate neither divine nor human law, we have no more authority to interfere than we have to control the domestic discipline of a father in his family.

"It is urged that the Good Templars are a society established for the promotion of temperance, and incorporated by the Legislature, and that any citizen has a right to join it. We do not doubt the beneficent objects of the society, and we admit that any citizen has a right to join it if the society consents. But this right is not of so high and solemn a character that it cannot be surrendered, and the son of the relator did voluntarily surrender it when he became a student of Wheaton College, for he knew, or must be taken to have known, that by the rules of the institution which he was voluntarily entering, he would be precluded from joining any secret society. When it is said that a persou has a legal *right* to do certain things, all that the phrase means is, that the law does not forbid these things to be done. It does not mean that the law guarantees the right to do them at all possible times and under all possible circumstances. A person, in his capacity as a citizen, may have the right to do many things which a student of Wheaton College cannot do without incurring the penalty of college laws. A person as a citizen, has a legal right to marry, or walk the streets at midnight, or to board at a public hotel, and yet it will be absurd to say that a college cannot forbid its students to do any of these things.

"The son of the relator has an undoubted legal right to join either Wheaton College or the Good Templars, and they have both an undoubted right to expel him if he refuses to abide by such regulations as they establish, not inconsistent with law or good morals."

. . .

AGRICULTURAL DEPARTMENT.

I present herewith the report of Prof. Morrow upon the Agricultural Department, from which it appears that this important interest makes a fair showing. The season will be remembered as peculiarly severe. Winter wheat on the farm suffered from the extreme cold and frost, and late crops from extreme heat and dryness. Other crops, as oats, hay, and especially corn, gave good returns.

Prof. Morrow has given much attention to general repairs, to care of hedges and fences and roads, to cleaning out corners and weedy places, and a consequent air of improvement and cleanliness has been observed, which is certainly of great importance on what ought to be made the model farm of the State of Illinois.

I cannot see that he has allowed this in any way to interfere with the actual needs of cultivation as the season required. It appears to have been accomplished by that prudent forethought which keeps farm-work always well in hand, and is one of the evidences of good practical management.

The success which attended the exhibition of animals from the University Farm at the Fat Stock Show at Chicago is well known to you. It has called forth numerous and hearty commendations from sources that have hitherto been silent or inimical, and has greatly strengthened our friends in the opinion that the Agricultural work of this

University has practical merit. A detailed statement of this experiment in feeding will find its appropriate place in your published reports. The same class of experiments will be continued.

The Dairy House and Farm Cottage ordered by you in June, are finished and occupied. A report on their construction will be given elsewhere. The Dairy House has begun to be a source of profit, and will give us opportunity for careful observation and experiment which will not be neglected. It may properly be added to the list of laboratories which are already notable features of our industrial work. The Piggery as ordered last year was to be made of wood,—but finding that we had an abundant supply of old bricks which could be put in place at still less cost, and to better purpose, change of material was made, which will doubtless meet your approval.

The Annual Agricultural Institute will be held at the University in the last week of January, from the 24th to the 27th inclusive. The programme promises to maintain the interest of former years. The usual appropriation of $100 is asked to defray necessary expenses.

Prof. Morrow asks that the apparatus used in conducting experiments on sorghum-sugar, consisting of a crushing mill, evaporating pan, etc., hitherto furnished at the expense of the Agricultural Department, be transferred to the department of Chemistry. It seems quite proper that all the expense of that investigation should be borne by the department which has conducted it.

I cordially concur in the expression of thanks which Professor Morrow desires me to express through you to the chairman of the Farm Committee, Mr. Scott, whose counsels and co-operation have so materially aided in the management of the farm affairs.

HORTICULTURAL DEPARTMENT.

For an account of the work in this department, I refer you to the report of Prof. Burrill, herewith submitted. I call your attention to his suggestions concerning the employment of assistance in this department for the coming year. In this connection, I desire to express my opinion that this University ought to possess a Plant House which shall be larger, more varied in its capacity, and in all respects of equipment and maintenance more nearly on the plane of the other laboratories of the University. Such a house should give opportunity for variety of temperature, moisture and exposure which do not now exist. Its botanical range should be greatly enlarged. At the same time the room for propagation of plants for sale might be attended, so that this department may have a chance to make itself self-supporting which does not now exist. Prof. Burrill desires to know your wishes as to whether this department of the work of the Green House should be made more prominent than heretofore.

The Architectural and Mechanical Departments have been fully occupied since commencement with the repairs and improvements ordered by you. The Architectural shop has been charged with the structure of the new buildings, and the wood-work has been done by it. The farm cottage, placed south of the barn on the Experimental farm, and on the cemetery road, is of brick, 24 by 30 feet, with attic and a good cellar. The walls, windows, doors and frame work are made with material from the old dormitory. The house has three rooms with pantry and closets on the ground floor, and two rooms in the attic.

The Dairy House is 15 feet by 30; its floor is depressed three feet below the surface of the ground to secure greater evenness of temperature. It stands near the farm house and north of the barn, which will shelter it considerably from the summer's sun. It has been constructed chiefly of old material.

The Boiler House is 34 by 80 feet—and 14 feet in height of wall. Its north end forms the south side of the quadrangle of the main building. Its floor is depressed four feet below the surface, and is covered with concrete. The first six feet of its walls are of rough rubble laid in cement; the remainder of the walls is of old brick surfaced with new. The roof is of matched flooring covered with metallic shingles. The interior is divided equally by a partition. The north end contains two Root boilers, which furnish steam for the main building through a six inch pipe. The capacity of the two boilers is 75 horse power each. Space remains for a third boiler, when it shall be removed from the Chemical building. The room also contains a small high pressure boiler, and the steam-pump, heater, etc. The south end has an estimated capacity of receiving 250 tons of coal.

The boiler flues are taken about 60 feet under ground to the chimney, which is placed south of the east wing of the main building, and as near as the foundations would permit. The foundation is twelve feet square, and is ten feet below the surface of the ground. With the first ten feet of the chimney above ground the foundation is of rough stone masonry laid in cement. The remainder of the chimney is of brick, and is circular above the octagonal stone base. The work has been excellently done. The scaffolding was placed inside the chimney and when removed the interior surface was smoothly plastered with lime and salt. The draft proves to be all that could be desired. The season was so far advanced before this work was done that it was not thought best to attempt the removal of the boiler from the Chemical building, which is therefore deferred to the future.

One of the boilers in the new house is new, taking the place of a condemned boiler from the basement of the main building. Thus far one of the boilers supplies abundant steam, and it is hoped that the second boiler in reserve will give us such power of warming the building in extreme cold weather as has never before been enjoyed.

The area of the quadrangle has been neatly graded, and such walks and approaches have been made about the boiler house as are required for delivery of coal and other purposes.

All the exterior wood and iron work of the main building has been thoroughly painted. The best lead and oil was purchased, and the work has been done under constant and

careful supervision. All the surface has received two coats, and where much exposed three have been used. The exterior of the Mechanical Building has been similarly treated.

A neat fence of wooden frame and iron palings has been set along the south line of Green street, fronting the Main Building.

Other work in hand will occupy the Carpenter Shop for the remainder of the collegiate year.

To all this work Professor Ricker and his assistant, Mr. Spencer, of the Carpenter Shop, with Foreman Kimball, of the Machine Shop, have given constant and efficient supervision.

SORGHUM SUGAR.

The course of experiments, authorized by you for the summer of 1880, to discover what useful information could be found concerning the products of sorghum cane, has been continued, also by your authority, and at expense defrayed by your appropriations during the present season. By your permission a pamphlet of twenty-four pages has been printed and is now ready for circulation, in which the experiments of Professors Weber and Scovell are detailed, and their practical results described. The subject has attracted great attention, and the public is constantly sending for information. Fifty pounds of sugar were exhibited in the name of the University at the Chicago Fair, and, if I am rightly informed, a premium was awarded therefor.

When the pamphlet mentioned above was about ready for issue, I was greatly surprised, and I may say profoundly disappointed, by the statement of Professor Weber that patents had already been issued to him and Professor Scovell, covering the processes, or as is now claimed, part of the processes discovered in this investigation. I felt it my duty at once to protest to Professor Weber against the action which he had taken. I expressed to him kindly, but earnestly, my doubts as to whether he was, in sound ethics, entitled to the products of work which he had done under your authority, while receiving your wages, and with the use of the appropriations which you had ordered from the funds of the University.

I stated to him my conviction that when this action should be known, especially if it should appear that it was taken with the connivance and consent of the Regent and the approval of the Trustees, public sentiment would be everywhere turned against the University and its government.

The agricultural public has been led to believe that these experiments have been conducted by its College, an institution founded in part for its benefit, in which knowledge pertaining to its industries was to be accumulated and freely disseminated. That public will believe that it is the proper proprietor of whatever information has been gained in this way, and it will quickly and keenly resent anything that savors of a sequestration of their property, and an appropriation of it to private uses.

I have since made this a subject of serious consideration, and I am yet unable to convince myself that under the circumstances Professors Weber and Scovell have a right to restrict the use of these discoveries by the monopoly which they claim. I am more than convinced that even if the legal right should be found with them, they have towards the University, and I believe towards themselves, committed a grave mistake, and one which in the sequel will cost the University more dollars than they can ever gain by enforcing their claim.

I deem it, therefore, my duty to call your attention to this subject, and to ask that you will give it the consideration which it needs, followed by such action as your enlightened judgment shall dictate.

In so doing, I desire that I may not in any way do prejudice to the rights of these gentlemen.

RULES.

The experience of the past year in administering the laws of the University has shown me that they are widely scattered and not readily accessible to Faculty or students. Some had grown obsolete; some were inconsistent; some needed better expression. These rules, including the acts of both Trustees and Faculty, have been collected, arranged and codified with care, first by a committee and afterwards by the whole Faculty. They have requested me to lay the result before you for your approval, with the request that you will order an edition printed, so that a copy may be placed in the hands of every student now in the University, and given to new students when they join.

An Apache Indian was brought to this University three years ago, and left for instruction. The members of the Young Men's Christian Association undertook his support, and have paid all expenses until now, except his College dues. He is studious, and makes fair progress. I recommend that in his case all College dues and charges be remitted.

A considerable number of students live at their homes so far from the University that they have to bring their lunch with them. To secure for such a wholesome place for dining, a few tables have been placed in a vacant room, with suitable cloths, plates, and glasses. About twenty ladies and a few gentlemen have used the dining room in a quiet and orderly way, the ladies taking the needful care. The tables were borrowed from the Physical Laboratory, and must be returned. If you approve the continuance of this experiment, new tables will be needed, and the expense, $25, already incurred, must be paid.

A second assistant has been found necessary in the Chemical Laboratory, in this as in former years. At Professor Weber's request I appointed student Howard Slauson to that duty, temporarily, at $10 per month. You are asked to approve this appointment, and to continue it for the remainder of the year.

I present the reports of the following committees:

1. Committee upon taking down the old Dormitory; the erection of Boiler House and chimney, and the purchase and setting of a new boiler.

2. Committee upon construction of Farm Cottage, and Dairy House.

3. Committee on the purchase of new Furniture.

I recommend the following appropriations:

For Farmers' Institute	$100 00
For expenses of delegates to Washington (additional)	200 00
For dining room furnishing	50 00
For new music for choir and band	25 00
For steam indicator for Mechanical Engineering	100 00

S. H. PEABODY, *Regent.*

DECEMBER 13, 1881.

Dr. S. H. Peabody, Regent:

The work on the University farms for the year ending Dec. 1, 1881, has been fairly successful. The season, as a whole, was unfavorable. The winter was severe, some storms especially. The spring opened rather late, increasing the cost of sowing and planting. The wheat and rye sown in autumn of 1880, as well as all grass and clover sown in spring of 1881, almost entirely failed. The drouth of the summer was of unusual severity and long continuance, seriously reducing the yield of corn and of the pastures and causing a practical failure of the potato crop. It was found necessary to supplement the pastures with more than the usual quantity of grain and cut green food. Much inconvenience and some increased expenditure was caused by partial failure of the water supply.

We were unfortunate in having $125 worth of hay destroyed by fire. The seed purchased of different varieties of sorghum failed, making the crop late and poor.

The estimate of quantity of corn and hay on hand when the farms were placed in my charge one year ago, proved rather sanguine, and I have also thought it proper to make a considerable reduction in the valuation of the tools and machinery. A more than usual amount of repairing, including painting of Farm House, has been necessary.

These, and some other facts, have tended to make the year's work not especially gratifying; but there have been some compensations. Prices for all farm products have been good. Our meadows gave good yields. The oat crop was good, and the corn yield was satisfactory, some of the early planted yielding nearly 70 bushels per acre. All the grass and grain crop were secured in good time and in good condition. We have carefully selected about 500 bushels of seed corn.

The live stock of the farms has been healthful and is now in satisfactory condition. Three old and inferior horses were disposed of, their places being supplied by a young mare transferred to "Teams and Tools" from "Salable Property," and by two good mares purchased. One of these has been sold at a fair profit.

The Short Horn and Jersey cattle have increased in number, and the calves of the year are more than usually promising, although reared cheaply. We have been fortunate in having a large proportion of the increase heifer calves, which will be retained.

In common with many of our neighbors we lost most of the early litters of pigs. Aside from this, the hog stock has done well.

A lot of steers purchased in spring of 1880, for experimental purposes, were fed during the year, and exhibited at the Fat Stock Show in Chicago, in November. The results were interesting and valuable, much more than repaying the extra cost of about $60, which the experiment involved.

A separate report of this and other experiments will be made. The year's profits might be made to appear somewhat larger if the cost of experimental work were deducted. This would be legitimate, but it is believed equally wise to consider experimental work the special field of our farm labors even if the showing of profits be less striking.

The Farm Cottage and Dairy House, provided for by special appropriations, have been completed and are in use. The former is a great convenience, and the latter promises to enable us to make dairy work a source of profit, as well as give facilities for experimentation. A Pig House has also been built, and is in use.

Omitting details, and even reference to many points of some interest, I may say that it would have been gratifying to have done more work in improving the farms, but that some of this work has been postponed and other parts done slowly, with a view to economy of expenditures.

I wish to express my thanks to the Chairman of the Farm Committee, who has kindly given his advice and suggestions in all important matters. While I have found it best to take direct supervision of the work, my thanks are due to T. F. Hunt, a student, who has assisted me in many ways, afthough his time has been largely occupied with the care of the dairy work. The force of laborers has, in the main, merited commendation.

The Receipts and Expenditures for the year are given in following summary. Detailed statements are in accompanying papers. The Inventory of Property is necessarily my own. I have aimed to give a fair present value to all articles. A shrinkage of $525 is made in the valuation of the Machinery and Tools, partly to cover loss and wear during the year, but mainly because it is believed the former valuation, although less than the original cost, was in excess of the present value.

Apparatus for manufacture of Sorghum Syrup and Sugar, purchased by the Agricultural Department and valued at $189.50, is, and has been, in the care of the Chemical Department, and it is requested this be transferred from the Farm property. This will leave the sum of $1,500 as estimated value of Farm Machinery and Tools, with $1,000 as value of the Farm Teams.

I hope it may be practicable for the Farm Committee to make an inventory of all the Farm property.

It will be remembered the Board of Trustees, at last meeting, transferred $3,000 from the Farm credits to the General Fund. It will be noticed the credits to the Farm, by the Business Agent's warrant account, shows a decrease of $841.43. The increase in the Salable Property and the Permanent Improvements, however, leaves a creditable balance as "profits of the year," although I trust other profit has come from the Farms by experimentation, and illustration to students and others.

Balance credit December 1, 1880		$6,530 96
Transferred to General Fund		3,000 00
		$3,530 96
Balance credit by Warrant Account December 1, 1881		$2,689 53
Decrease by Warrant Account		841 43
Receipts of the year	$6,254 80	
Expenditures of the year	7,095 23	
	$840 43	
Salable property December 1, 1880		$9,128 79
Salable property December 1, 1881		11,920 00
Increase		$2,791 21
Teams and tools December 1, 1880		$2,500 00
Teams and tools December 1, 1881		2,689 50
Increase		$189 50
Dairy apparatus		75 00
		$264 50
Total increase in property		$3,055 71
Permanent improvements		857 16
		$3,912 87
Less		841 43
Balance to year's work		$3,071 44

G. E. MORROW, *Professor of Agriculture.*

UNIVERSITY FARMS.

Salable property, December 1, 1881.

CATTLE:			
Shorthorns	14 cows	$1,920 00	
	4 heifers	450 00	
	3 heifers (yearlings)	225 00	
	8 heifer calves	525 00	
	2 bull calves	150 00	
	1 bull	300 00	
	32 head		$3,570 00
Jerseys	4 cows	$500 00	
	1 heifer	75 00	
	2 heifer calves	100 00	
	3 bull calves	175 00	
	10 head		850 00
Grade cattle	21 cows at $35	$735 00	
	15 heifers at $27	405 00	
	21 young steers	500 00	
	1 fat steer	75 00	
	17 calves at $10	170 00	
	75 head		1,885 00
Hogs	23 fatting hogs at $15	$345 00	
	Breeding stock and pigs	500 00	
			845 00
Colts	1 two year, 1 yearling, 2 years colts		325 00
Poultry	10 Plymouth Rock pullets		10 00

Corn—4,500 bushels, at 50 cents	$2,250 00
Oats— 800 " " 40 "	320 00
Hay—125 tons	1,300 00
Corn fodder	125 00
Oat straw	100 00
Rye and grass—65 acres	200 00
Manzels, artichokes and potatoes	65 00
Cider	80 00
Wood	25 00
Total salable property	$11,920 00

TEAMS AND TOOLS.

Horses:	
Nine head	$1,000 00
Tools:	
Inventory December 1, 1880	1,500 00
Purchased during the year	715 00
Total	$2,215 00
Sorghum apparatus	189 50
(Transferred)	$2,025 50
Deduct	525 50
Present extracted value	$1,500 00

MACHINERY PURCHASED.

Screw pulverizer	$200 00
Self-binding Harvester	250 00
Plows	90 00
Spring wagon and harness	75 00
Mower	75 00
Cultivator and small tools	25 00
Total	$715 00

RECEIPTS FOR YEAR.

Cattle	$2,044 26
Hogs	562 67
Corn	949 23
Hay	748 12
Butter and milk	332 47
Wheat	85 70
Old implements	25 00
Horses	360 00
Colts	175 00
Poultry	9 25
Potatoes	29 15
Wood and cobs	27 65
Miscellaneous	44 80
Rent of "Griggs Farm."	560 00
Work for other Departments	301 50
Total	$6,254 80

PERMANENT IMPROVEMENTS AND FIXTURES FOR YEAR.

Drainage	$114 62
Fencing	242 29
Wells	196 10
Pig house	130 00
Labor on new buildings	63 00
Pumps	60 00
Trees and planting	25 85
Privy for Farm House	25 50
Total	$857 16
Repairs on Farm House	286 16
Dairy apparatus—present value	75 00

ILLINOIS INDUSTRIAL UNIVERSITY, December 8, 1881.

Dr. S. H. Peabody, Regent.

SIR: I herewith respectfully submit a report of the condition and operations of the Horticultural Department for the year ending with this date.

The season, so far as the growth of plants and crops is concerned, has been a very peculiar one. The warm spring-like autumn of 1880, followed by the rigorous freezing of November, the severity of the winter, the backwardness of the spring owing to wet and cold, the excessive and long continued drouth of summer, and the remarkable humidity of the last autumn make a combination of conditions and influences altogether exceptional with us. Many kinds of crops failed entirely, few were as good as usual.

THE ORCHARD.

This being an "off year" the full crop of fruit was not expected from the orchard, but such as might otherwise have been looked for was almost entirely cut off. Peach-trees were killed or so badly affected as to be practicably worthless. Cherries and pears produced but little fruit. The apple orchard was so nearly barren that no attempt was made at harvesting. The few apples borne by the trees prematurely ripened and decayed. With the exception of a few crab apples, the lady-apple is the only apple that has uniformly borne a fair crop during the last half dozen years. This very small but very excellent fruit might be quite renumerative if people usually knew its value as a dessert apple. It is however unsalable with us.

GRAPES AND SMALL FRUITS.

Concord grapes yielded a good crop of medium quality. The fruit ripened earlier than usual and was of less size than heretofore under the same treatment. Some other varieties did fairly well. Very little rot was observed. The experiment of protecting the bunches with paper-bags was tried, with the effect of entirely preventing the parastic diseases (insects and fungi) and the attack of birds, and of producing the freshest, finest appearing berries.

Among the small fruits the only ones to be accounted successful were the strawberries which had been well protected by mulching during the winter. These were very fine. Several of the newer kinds especially merited and gained much favorable comment. Cresent Seedling, Sharples, Captain Jack, and Kentucky especially gave an abundant yield of very fine fruit. Raspberries and Blackberries would have been fairly productive, but for the dry weather which caused the fruit to be very small and often to shrivel on the bushes. The Snyder blackberry is however the only one of its kind not practically destroyed year by year during the winter. This was in excellent condition in the spring, and the prospect for a fine crop was good until the first of June or a little later.

TREES.

Nearly all the shade and ornamental trees transplanted last spring, though starting with full promise of success, died during the latter part of the year. Considerable numbers also of those planted a year or more ago perished, so destructive was the drouth. The young nursery stock, though not so badly affected, did not succeed as well as common. With some notable exceptions, even weeds did not make their usual luxuriant growth.

ANNUAL PLANTS.

Except those early maturing of garden vegetables and similar plants, even medium crops were not produced. A half acre of the young apple orchard, planted to Hubbard squash, totally failed. Of several kinds of medicinal herbs those maturing before midsummer did well, while the late ones failed or made an abundant autumnal growth which could not be saved without artificial drying. Encouraged by last year's success with chiccory, a larger plantation was made this year. A medium crop was secured, but the parties for whom it was grown, and to whom it was supposed to be sold, having refused to take more than a small fraction of the amount on hand, we are attempting to prepare the remainder for the general market. There is a large demand for the article, the supply at present being entirely from abroad, (Europe); but whether the crop can be profitably raised with us cannot be told until the trial is completed.

FINANCES.

Notwithstanding the difficulties encountered, thanks for a great part to the sale of nursery stock grown during the previous years, and the very marked increase of demand for greenhouse plants and flowers, together with the unusually light expenses, the financial condition of the Department, shown by the report of the Business Agent, is quite satisfactory,—better than in some more favorable years.

Under the circumstances, it seems unreasonable that any one can expect a more favorable report in this respect.

THE ORNAMENTAL GROUNDS.

The work on the ornamental grounds has been efficiently prosecuted, and the results have been, so far as known to myself, reasonably satisfactory. But for the bad effects of the drouth, the lawn, gaining with age, and the flower-beds would have been more attractive than ever before. As it was, the good appearance overcame the feeling of disappointment on account of the failures which occurred.

The required grading and road construction, though of necessity postponed until after the building operations were completed, and until after more pressing work was done, have been nearly finished. The new fence is also nearly completed, and promises to be the most appropriate and conspicuous improvement ever made—partially through contrast—towards the ornamentation of the grounds. The gates put in last spring, though requiring frequent adjustment, very satisfactorily answer the purpose for which they are designed, and prove to be a great convenience as well as protection.

The condition of and apparent prospects for the old Dormitory grounds are by no means pleasant to report upon. The great amount of teaming by numerous disinterested parties, exposed more than ever the grounds to the heretofore almost hopeless inroads of hungry cows, aided in some cases by the opening or breaking of the gates and fences by more responsible, if less conscientious, beings. The appearance of abandonment encourages such lawless acts, and until everything is cleaned up and put in apparent order they doubtless will continue. It is really doubtful whether the place can be kept in respectable condition until occupied by some one having authority and control.

If not to be otherwise used in the near future, I respectfully recommend the cleaning up of the entire Dormitory remains, including the walks and drives, the removal of all shurbs and flowering plants, except perhaps some of the largest and best around the borders, together with such trees as will not be ultimately ornamentally useful; the leveling and smoothing of the surface; the liberal enrichment of the ground at the north end now too poor to produce grass, the result of aforetime grading and brickmaking, and the seeding with meadow grass or grasses. For the latter, one or more of the not commonly cultivated perennial grasses would be commended as an experiment, to be cut twice a year for hay. This would give an appearance of profitable use and at the same time neatness of condition. The portion used by the Military Department should be kept as a lawn.

In any case the fences need thorough repair. For the good name of the University, it is important that something be done.

INVESTIGATIONS.

Other work unexpectedly prevented the full investigations planned for the summer vacation on blight and kindred diseases of plants. Further experiments were however made upon the so-called fire-blight of pear trees, and these fully confirmed the results of the previous year. Further information also showed that this same disease is not uncommon in many other plants. Among those now known to suffer in this way (the appearances differing according to the kinds) are the maples, elms, willows, poplars, apple, mountain ash, lilac, roses, pæony, and probably the potato. Almost surely this list is to be greatly extended by future researches. A remarkable fact is that in no case yet found are the roots of any kinds affected except as the contagion reaches them through the gradual process of the diseased stem,—a striking proof of the correctness of my conclusions as to the nature of the disease, and a sufficient commentary on the common notions as to the peculiarities, management, composition, heat, &c., of the soil being the real cause of the mischief. The disease is as specific in nature and origin as any plant or animal. It never develops spontaneously whatever the conditions or influences.

As to cure, nothing has been found except the careful removal of infected portions; but with the light we now have this process is very effectual in most cases. The directions in my last report have been followed by one of the largest pear growers in the United States with much satisfaction to himself. Others have also reported favorably upon the treatment of apple trees.

While pursuing such investigations during the summer, I was astonished to find in healthy plants living organisms similar, though not identical, to those causing blight. It is impossible to state what results may follow from this discovery, but its importance in one direction may be partially comprehended when it is further announced that in one case these organisms taken directly from the juices of the plant and placed on the human skin propagate freely and abundantly and produce a violent inflammation. This inflammation has long been familiarly known, but has never been scientifically accounted for heretofore. I refer to the effects of the so-called poison ivy of our woods. The proofs of the nature of the poison are well nigh incontrovertible, of which a full report will be made at another time. The new microscope, for which an appropriation was made at the last meeting of the Board, is in course of construction and is expected sometime before spring.

HORTICULTURAL ASSISTANCE.

Six months ago the Board of Trustees kindly authorized me to nominate a foreman for the Horticultural Department. Recognizing the importance of securing the right man, I have preferred to delay such nomination rather than select any so far known. The conclusion is indeed gradually being forced upon me that it is not possible, within the presumed limits of expenditure, to procure one man competent to act as a working foreman for the department, as a whole. A gardener can probably be secured who will probably give reasonable satisfaction in charge of the green-house, garden, and grounds, and it is probable that a *trained workman* can also be secured for the fruit and tree plantations, without which it is scarcely possible to make satisfactory progress in this line. With such men no other supervision than that devolving upon myself would be required.

For the farm operations, a man capable of earning $100 per year, or its equivalent, ought to be able to do the required work without close watching and directing, and with such a man I am sure the work could be more economically and satisfactorily done than by miscellaneous hiring. The small fruits have given profitable returns during ten years past, and by extending these plantations somewhat, the extra expense, if any, could be met.

For a gardener such as is required, $600 per year is as little as will probably be found adequate. This is considerably more than the cost at present, and the difference in money may not be easy to meet by increased sales, though something in this way would naturally follow. If, however, the possible extra expense can be provided for, the employment of such a man can not be too strongly urged. It would contribute not only to the better appearance and tasteful order of the premises, but to the real progress of the department in usefulness at home and reputation abroad. I now respectfully ask leave to find such men, if possible, to take positions next spring. Without full assurance, however, that the right man or men are found no nomination will be made. We *can* get along as we have done.

Very respectfully submitted,

T. J. BURRILL.

The Regent also submitted the following reports of special committees, all of which were received and approved:

CHAMPAIGN, ILL., December 12, 1881.

To the Trustees of the Illinois Industrial University:

GENTLEMEN: Your committee, consisting of the Executive Committee, Regent and Business Agent, charged by you with certain duties, respectfully report:

1. The Old Dormitory Building. They have caused this building to be taken down, as you directed, care being taken to preserve the material, as far as possible, in condition for other uses. So much as could be used was used in building the Farm Cottage, Dairy House and Piggery on the Farm, and the Boiler House and chimney near the Main Building. A considerable quantity of broken bricks has been used for improving the drives about the Main Building.

Your committee have believed that sound discretion would dictate the sale of such old material as the University did not require, if it could be disposed of at fair prices, as by this means a large part of the expense incurred in the work of taking down, could be reimbursed. They have accordingly sold, when purchasers were found. Some materials remain unsold, from which some value may yet be secured by prudent management.

Your committee recommend that the material remaining be transferred to the account of Buildings and Grounds, and that authority be given to use the avails thereof in improving the grounds of the University as it may be needed.

ACCOUNT OF EXPENSES AND RECEIPTS.

Paid for labor in taking down building		$1,548 71
Paid for hauling material used in building		235 47
		$1,784 18
Received for material sold	$904 16	
Received from University credit	940 00	
Due in tile (exchange)	153 00	$1,997 16
Balance of credits above expense		$212 98

2. Your committee further report that they have caused a Boiler House and chimney to be built according to the designs and plans presented by Prof. Ricker, and approved by the Board.

The Boiler House is 34 by 80 feet, and 14 feet high at the walls. The walls are of stone for the first six feet, and brick for the remaining height. The roof is of wood, covered with iron shingles. The chimney is 97 feet high from the surface of the ground, and 107 feet above the foundation. The first 20 feet is of stone, the remainder of brick. The diameter is 8 feet at the ground, 6 feet at the top. Smoke is carried to the chimney through brick arched ducts, underground, and steam to the Main Building through a similar arched duct.

A new 75 horse-power water-tube boiler, made by Abendroth and Root, of New York, has been purchased to take the place of the old boiler which had been condemned. The new boiler, with another of the same capacity bought two years ago, is set in the Boiler House, and the steam therefrom is carried by a six inch pipe to the Main Building. The action of the boilers, ducts, chimneys, and the appurtenances, has thus far satisfied every anticipation.

The sums expended are as follows:

For material for Boiler House, chimney, smoke and air flues, etc	$3,067 46
For labor	1,839 60
Total for Boiler House	$4,907 06
For new boiler, steam pipes in Main Building, steam traps, etc	$1,847 99
For labor	378 78
Total for boiler, etc	$2,226 77

Respectfully submitted,

S. H. PEABODY,
J. T. PEARMAN,
Committee.

CHAMPAIGN, ILL., December 12, 1881.

To the Trustees of the Illinois Industrial University:

GENTLEMEN: Your committee charged with the duty of erecting a Farm Cottage and a Dairy House respectfully report:

They have caused a Farm Cottage to be built south of the barn on the Experimental Farm, and near the road which divides the farm from the cemetery. The house is 24 by 30 feet, one story high, with cellar; it contains three rooms, with pantry and closets on the ground floor.

They have also caused to be built a Dairy House immediately north of the barn before mentioned, and opposite to the Farm House. This building is 15 by 30, divided into three rooms.

Both these houses have been made of the bricks and other material obtained from the old Dormitory building, as far as such material could be made available.

The cost has been:

For materials	$474	24
For labor	525	94
	$1,000	18
Appropriation of Legislature	$1,000	00

Respectfully submitted,

S. H. PEABODY,
J. T. PEARMAN,
Committee.

ILLINOIS INDUSTRIAL UNIVERSITY,
CHAMPAIGN, ILL., Dec. 13, 1881.

To the Hon. Board of Trustees, Illinois Industrial University:

Your committee beg leave to report, that they have purchased such articles of furniture as were deemed most necessary or desirable, and have expended $954.35 of the appropriation, leaving a balance of $45.65.

A list of articles and prices accompanies this report.

Very respectfully,

S. H. PEABODY,
S. W. SHATTUCK,
E. SNYDER,
Committee.

CHAMPAIGN, ILL., December 13, 1881.

Purchased as follows:

Sixty settees	$404	00
Labor in setting up	9	70
Twelve dozen chairs	102	50
Fourteen desks	153	00
Carpets and shades	72	95
Shade cloth	11	50
Fifteen chairs for teachers	67	50
File cabinet case, Regent's office	26	20
Slating	46	30
Blackboard work	8	75
One dozen chairs for dining room	10	00
Repainting old chairs, work	23	12
Varnish, oils, etc	10	83
Hard oil finish	8	00
	$954	35
Unexpended	45	65
Appropriation	$1,000	00

After hearing these reports the Board adjourned to 7:30 P. M.

EVENING SESSION.

The Board met as by adjournment; present as before.

The Committee on Rifle Range reported progress, but asked and was granted further time. The Committee on Painting and Shelters was continued, and the Committee, on a communication from Judge Smith was discharged on request of the chairman.

The Committee on Publishing Experiments with Sorghum Cane reported that the pamphlet had been published at a cost of $55.

The report was received and approved.

The Treasurer submitted his report, which was received and ordered on file:

ILLINOIS INDUSTRIAL UNIVERSITY.

To JOHN W. BUNN, *Treasurer.*

1881.	CR.		
Sept. 13	To balance		$21,162 52
30	" amount received on account fees	$2,637 50	
	" amount received on account tuition in Prep. Dep't.	750 00	
	" amount received on account buildings and grounds.	36 00	
			3,423 50
Oct. 1	" interest on Douglas County School bonds		350 00
Nov. 30	" amount received on account buildings and grounds.	$16 00	
	" " " " Agricultural Departm't.	2,495 34	
	" " " " Mechanical "	494 29	
	" " " " Architectural "	1,104 84	
	" " " " Horticultural "	49 55	
	" " " " Chemical "	617 18	
	" " " " Library and apparatus.	1 75	
	" " " " Fees	277 50	
	" " " " Illinois Central Railroad and freights	780 75	
			5,837 20
			$30,773 22

1881.	DR.		
Nov. 30	For amount paid Board expense	$123 18	
	" " " salaries	5,383 41	
	" " " for buildings and grounds	51 25	
	" " " for fuel and lights	1,280 14	
	" " " for stationery and printing	310 27	
	" " " for fixtures and furniture	48 45	
	" " " for Mechanical Department	376 61	
	" " " for Architectural "	1,139 56	
	" " " for Agricultural "	1,516 21	
	" " " for Horticultural "	165 41	
	" " " for Chemical "	756 25	
	" " " for Military "	59 00	
	" " " for library and apparatus	13 15	
	" " " for incidental expenses	52 20	
			$11,275 09
	" " " for Preparatory Department	$615 00	
	" " " for College of Engineering	13 05	
	" " " for examining schools	5 30	
			633 35
	" " " for buildings and grounds	$1,139 16	
	" " " for Chemical, Physical and Botanical Laboratories	26 75	
	" " " for current expenses	2,140 00	
	" " " for cabinets	5 53	
	" " " for Mechanical and Arch. shops	498 40	
	" " " for Farm Cottage and Dairy	228 42	
	" " " for Boiler House	2,981 65	
	" " " for furniture	247 25	
	" " " for books and publications	198 27	
	" " " for heating and ventilation	294 51	
			7,669 94
	Balance		11,194 84
			$30,773 22

JOHN W. BUNN, *Treasurer.*

URBANA, December 13, 1881.

A petition from the Adelphic Society in regard to changes in their Hall, was referred to a committee consisting of the Regent and the Professor of Architecture, with power to act, provided no expense to the University be incurred.

The Regent's report was taken up for consideration.

The subject of Secret Fraternities was deferred until 10:30 to-morrow morning, and the Secretary was instructed to notifiy the committee of students to appear before the Board.

The expense of apparatus for experiments in Sorghum was ordered transferred from the Agricultural to the Chemical Department.

The Professor of Horticulture was authorized to use the facilities of the greenhouses for raising plants and flowers for sale, so as to partly defray the expenses of the Department.

Prof. Burrill was authorized to carry out the suggestions in his report in regard to assistance in his Department, with advice and concurrence of the Regent.

The Secretary was instructed to notify Professors Weber and Scovell to appear before the Board at 8:30 a. m., and the consideration of the experiments and patents was postponed until after they had been heard.

The report of the Business Agent was received and filed:

Current Appropriations.

	Appropriated.	Receipts also appropriated.	Expended.	Balance.
Board expense	$300 00		$123 18	$176 82
Salaries	11,820 00		5,383 41	6,436 59
Fuel and lights	2,800 00		1,280 14	1,519 86
Stationery and printing	500 00		310 27	189 73
Buildings and grounds	50 00	$52 00	51 25	50 75
Furniture and fixtures	50 00		48 45	1 55
Military Department	150 00		59 00	91 00
Library and apparatus	50 00	1 75	13 15	38 60
Incidentals	200 00		52 20	147 80
Mechanical Department	54 79	494 29	376 61	172 47
Architectural "		1,104 84	1,139 56	34 72
Agricultural "	1,710 40	2,495 34	1,516 21	2,689 53
Horticultural "	352 12	49 55	165 41	236 26
Chemical "	140 62	617 18	756 25	1 55
Sundries:				
Physical Laboratory	34 89			34 89
Students' government	17 75			17 75
Engineering College	16 45		13 05	3 50
Examination of schools	42 43		5 30	37 13
Tuition—Preparatory year		750 00	615 00	135 00
Other receipts:				
Students' fees		2,915 00		
Illinois Central freights		780 75		

State Appropriations.

	Appropriated.	Received.	Expended.	Balance.
Taxes on lands—½ per annum	$5,000 00	$2,310 37	$2,310 37	
Buildings and grounds—½ per annum	5,000 00	2,500 00	2,145 19	$354 81
Chemical, Physical, and Botanical laboratories—½ per annum	1,600 00	800 00	29 97	770 03
Mechanical and Architectural shops—½ per annum	3,000 00	1,500 00	598 40	901 60
Books and publications—½ per annum	3,000 00	1,500 00	203 77	1,296 23
Current expense—½ per annum	11,400 00	5,700 00	2,140 00	3,560 00
Library cases—½ per annum	800 00	800 00		800 00
Cabinets	1,000 00	1,000 00	93 99	906 01
Engineering instruments	1,000 00	1,000 00	657 45	342 55
Furniture	1,000 00	1,000 00	954 35	45 65
Boiler house	5,000 00	5,000 00	4,907 06	92 94
Heating and ventilation	2,500 00	2,500 00	2,226 77	273 23
Farm Cottage and Dairy	1,000 00	1,000 00	1,000 18	

The vouchers were referred to a committee consisting of Messrs. McLean and Bennett.

The By-Laws and Regulations for students, as compiled by the the Faculty and submitted by the Regent for the approval of the

Board, were referred to a committee consisting of the Regent, Messrs. Bennett and Pearman, for revision and publication, and $50 was appropriated for the purpose.

On recommendation of the Regent all the College fees of student Charles Montezuma, an Indian of the Apache Nation, were remitted during good standing through his entire College course.

The following appropriations were made: For fitting up of student's dining room, $50; for traveling expenses of delegation to Washington, $200; for new music for choir and band, $25; and $100 for steam indicator for Mechanical Department.

Mr. Howard Slauson was employed as Assistant in Chemical Laboratory for the balance of the academic year, at $10 per month.

Adjourned to 8:30 A. M.

SECOND DAY'S SESSION.

The Board met as by adjournment; present as before.

Professors Weber and Scovell appeared before the Board and made statements in regard to letters patent taken out on manipulating products of Sorghum cane.

The following resolution was offered by Mr. Millard and seconded by Mr. Bennett:

WHEREAS, the Trustees of this University learned, with regret, that Professors Weber and Scovell have recently obtained letters patent for the manufacture of sugar, syrups and glucose from sorghum cane, the invention or device being discovered while the said Professors were prosecuting investigations for such results under the direction and at the expense of the Board of Trustees; therefore be it

Resolved, That the Board, at this its first session after learning of such action, as we now understand it, do hereby condemn and place our disapproval upon the action of said Professors, and direct that the Chairman of this Board report to the Governor of the State and the Attorney General the facts and circumstances in the case, and obtain their advice and recommendation in the matter, and report the same to this Board at its next session

Mr. Scott called for the ayes and noes. Ayes—Messrs. Bennett, Mason, McLean, Millard and Pearman. Noes—Messrs. Paden and Scott. Carried.

The following resolutions were offered by Mr. McLean, and adopted:

WHEREAS, It is desirable to have a more complete record of the property belonging to the University; therefore,

Resolved, That the Regent and Business Agent be, and they are, hereby requested to procure as soon as practicable proper books, and cause to be made out a careful and correct itemized list of all the property belonging to this University and its several departments.

Resolved, That such books, when completed shall be copied in duplicate, and one of them shall be kept in the respective department to which they belong, and the respective professor of the department shall keep up such record by including in it all additional property placed therein from time to time, and the disposition of any property.

Resolved, That as soon as such record shall be completed it shall be reported to this Board, and thereafter an annual report of the condition and amount of said property shall be made to this Board by the Regent at the regular meeting.

Resolved, That the duplicate copy of such books shall be also kept up and deposited in some safe place outside of the University, to be used in case of loss or destruction of any or all the books in common use.

Resolved, That the members of the Faculty render such assistance as may be called for from them by the Regent in making and keeping up such schedules, and that the sum of $50 be appropriated for the purpose.

The Board then heard the statements from a committee of students in regard to secret societies, and, on motion, the petition presented by those secret societies was not granted.

Messrs. Pearman and Scott, an Auditing Committee appointed last meeting, reported that they had examined the vouchers accompanying the Business Agent's report, Nos. 385 to 659, inclusive, and found them correct. The report was accepted.

The Auditing Committee, appointed at this meeting, made the following report:

To the Board of Trustees:

Your committee would beg leave to report that we have examined the vouchers from No. 1 to 254, inclusive, and find the same correct, except No. 140, which is missing, and number (see list) not yet receipted; all, however, are properly certified to by proper officers.

ALEXANDER McLEAN,
CHARLES BENNETT.

The report was received.

Adjourned.

E. SNYDER,
Secretary.

EMORY COBB,
President,

BOARD MEETING, MARCH 14, 1882.

The Board met in the University parlor at 4 o'clock P. M.

Present—Messrs. Cobb, McLean, Millard, Pearman, Paden and Scott.

Absent—Governor Cullom, Messrs. Bird, Bennett and Mason.

The record of last meeting was read approved.

The election of officers was postponed until March 15th, 1882.

The Regent read his report, which was received:

To the Trustees of the Illinois Industrial University:

GENTLEMEN: The quarter of the year now ended closes also the first year of my service as Regent of this University. When I accepted the trust you were pleased to commit to me, I came to an institution already organized and officered, and which had made for itself a record for its substantial progress. The situation appeared to me one which called not for work of reconstruction, but of administration; carrying forward, in the main, the existing state of affairs, suggesting changes or improvements only as they seemed required in the continual growth of the enterprise.

A retrospect of the year's work shows reasonable progress. The legislative appropriations were such as provided fairly for most of our present needs. Especially is there reason for thankfulness that the State has admitted the necessity and the propriety of assisting the finances by providing in part for current expenditures, thus supplying a portion of the deficit in income, caused by diminished rates of interest. During the year some improvements have been made, which increase the usefulness and the adornment of the University property. The old dormitory, at once a menace and a blemish, has been removed. A boiler-house with improved facilities for heating the main building has been erected, and other items of less note added. Plain and comfortable furniture has been placed in the class-rooms. Instruments of precision of the best quality have been added to the facilities of the engineering and botanical work. The library, museum and laboratories have received their annual increase.

The attendance of students does not vary materially from that of former years. Our present numbers may be construed as favorable to the institution when we consider the serious depression which the agricultural interests have suffered in some parts of the State, as the results of flood and drouth. The failure in the last harvest prevented many students from coming whose faces had been turned in our direction.

The morale of our students has been commendable, continuing the good name which the University has gained in this respect. Loyalty, order and studious habits are the normal conditions of our young men and women. Violations of order and propriety are the exceptions. A portion, including some of the most earnest and faithful, sought to introduce secret fraternities. In the discussions which followed they presented their wishes in a manner so manly and courteous that if their representations had not been met by the opinions of those of larger experience in these matters, who believed that the young men were in error as to the ultimate results of their plans, they might with much plausibility have secured the object they coveted. To their credit be it written that when the students found that your decision was adverse to them, after a momentary expression of dissatisfaction they yielded kindly and quietly to your wishes and to the authority of the University. They have with good grace abandoned what some of them had very earnestly set their hearts upon. I am confident that their maturer judgment will approve the result, though it is probably too early to expect such an admission at present.

It seems proper that I should take this occasion to review the educational work of the various departments of the University. That I have not done so before has been because I have wished that time would permit me to become more thoroughly familiar with the actual condition of affairs. I preface my review with a table showing, as far as a table can exhibit, the work of each instructor in the class-room and out of it:

Professor or Instructor.	No. classes	No. hours per week.	No. Pupils. Male.	No. Pupils. Fem.	Total.	Remarks.
Selem H. Peabody	2	15	50	12	62	Regent
Thomas J. Burrill	3	21	25	4	29	Vice-President, Supt. of Grounds and Horticulture
Samuel W. Shattuck	3	15	53	11	64	Business Agent
Edward Synder	5	25	120	43	163	Recording Secretary
Don Carlos Taft	3	15	26	20	46	Curator
Joseph C. Pickard	4	20	50	31	81	
N. Clifford Ricker	4	20	18	1	19	
Jas. D. Crawford	4	20	46	21	67	Librarian
Henry A. Weber	2	20	49	14	63	
George E. Morrow	2	10	14	.....	14	Farm Superintendent
Frederick W. Prentice	2	10	16	.....	16	
Peter Roos	3	20	22	20	42	
William T. Wood	2	4	17	.....	17	U. S. Army Officer, Drill Master.
Ira O. Baker	3	20	34	.....	34	
Melville A. Scovell	1	8	14	.....	14	Assistant in Chemical Laboratory
Chas. E. Pickard	5	25	43	15	58	
Cecil H. Peabody	3	17	16	.....	16	Assistant in Physical Laboratory.
Edwin A. Kimball	2	20	22	.....	22	Foreman of Machine Shop
Jerome Sondericker	2	15	57	.....	57	Assistant in Physical Laboratory
Nelson S. Spencer	1	10	6	.....	6	Foreman of Carpenter Shop
Chas. C. Barnes	.....	20	.....	.....	.....	Assistant in Chemical Laboratory
Chas. W. Rolfe	2	10	38	6	44	Assistant in Botany
Jas. E. Armstrong	2	10	37	8	45	Assistant in Natural History

The College of Agriculture steadily maintains a high character under Professors Morrow, Burrill, and Prentice. In addition to their lecture room work, which shows careful and scholarly preparation, each has a large general responsibility. Professor Morrow's duties on the farm involve the ceaseless care demanded in the management of five hundred acres of land and more than two hundred head of stock of all kinds. His work has received the oversight, the counsel, and I understand the approval, of the Farm committee. It exhibits worthy results from both an educational and a financial standpoint. In its farther systemization he will need the assistance of an intelligent foreman whose ideas and methods are in sympathy with his own.

Similar service is required in Professor Burrill's department. Wtth right help and proper development there seems to be no reason why the department of Horticulture may not become self-sustaining without imparing, but rather to the benefit of, its efficiency as a means of instruction. Only his great caution in seeking for a gardener who shall prove in all respects the best man for the place has prevented him from securing already the help he needs.

Professor Prentice's classes in Physiology and Veterinary Science continue to show high appreciation of his qualities as an instructor. It has also been fortunate for the University in various ways that we have in our corps of Professors a skillful and conscientious physician not less able to treat the human system than to work in his chosen field of Veterinary Science. The veterinary clinics are gaining useful notoriety, valuable alike to the farmers and to the departments.

On account of disappointment in securing desired assistance and for other reasons, the annual Farmers' Institute usually held in January was this year omitted. The omission has called forth many inquiries indicating anxiety lest this gathering should be finally suspended, and showing a wider and deeper interest in it than had been supposed to exist. It is possible that a more comprehensive plan, so devised as to interfere less with regular collegiate duties, and which should bring a larger proportion of outside assistance, would make this feature of the work in the College of Agriculture more fruitful of good to attendants, to the State at large, and to the University.

In this connection I may refer to a suggestion which the President of the State Board of Agriculture has twice made in his annual report. It is that the Regent and Professor of Agriculture of this University be requested to prepare a text-book in elementary Agriculture for use in the Public Schools of the State. A useful treatise of this sort might be prepared. Its adoption would be problematical, perhaps doubtful. The preparation of such a book can hardly be deemed part of the duty of the officers mentioned, even if it should appear that they were or ought to be specially qualified for its execution. It would seem necessary, before such work is undertaken, that it should be done with your permission, and with a distinct understanding as to the proprietary interests which might exist in such a work when completed.

THE COLLEGE OF ENGINEERING.

This College is under the special direction of Professors Ricker and Baker, and the Regent as Professor of Mechanical Engineering. By faithful and quiet, but persistent effort Professor Ricker has so developed the school of Architecture that it now ranks with the similar schools in Cornell University, Columbia College, and the Massachusetts Institute of Technology, which are the recognized leaders, if not the only practical schools that teach this specialty in the United States. Its position was conceded by Professor Wm. A. Ware, who may be counted the first of American architectural instructors, after a critical examination of the methods and results of this school, given at a visit in the late vacation. If the course in Architecture should be criticized at all, it would be by saying that it is too full, and too absorbing in its interest—a condition of things which may easily be condoned, and were worthy of imitation in other quarters. Professor Ricker has been fortunate for the last three years in the support of a foreman, Mr. N. S. Spencer, who has been inspired with similar views of the architect's perfection. Inspection of like work done in other shops of instruction has convinced me that the product of our wood shop has no superior in the precision which is attained by the students under the careful supervision they receive.

Professor Baker's work in civil engineering has the same stamp of accurate and clean finish. With easy command of his students, and critical study on his own part, Professor Baker is making, year by year, a valuable record. The late unexampled increase of railroad building has led many students to seek this course, and often to seek some short and easy side-track, by which, with a little experience in the theory of instruments and a minimum of hard work, they could get as they supposed in the Professor's good book, as next in order for a call for assistants in engineering works among the western plains and mountains. While appreciating the eagerness with which young men are looking for paying employment, and anxious to help those who are worthy of aid, Professor Baker has had my approval in his desire to send out only such to represent this school, as could do so with credit—such credit as many of our men are actually earning in the field.

The new instrument for higher geodetic work, a Troughten and Simm's twelve inch theodolite, ordered by you last summer, has been very lately received. We have been fortunate in securing it at a cost much less than our lowest estimate. Such examinations as its brief time of possession allows, indicates that it is every way satisfactory, and a most valuable addition to our engineering facilities.

The efficient aid of Professor Cecil H. Peabody has added life to the instruction in mechanical engineering, while affairs at the shop have been directed by Mr. E. A. Kimball with his well-known faithful care. The class of new students has again to be reported as an increase upon any previous number, so large, indeed, as to make proper attention to them difficult under the present arrangements. This subject has been treated in a special report, to which I ask your attention.

Mr. Jerome Sondericker has improved upon the good quality of his work of last year in engineering and other exact drawing. We shall do well to retain his services as long as possible. In addition to his drawing he has assisted Professor Shattuck in mathematics, Professor Burrill in landscape gardening, and has done service in the Physical laboratory.

The schools of Engineering and Architecture find their chief corner-stone in the pure mathematics, in which instruction has ever been ably given by Professor Shattuck. This department is not one in which any public display can ever be made, nor is it one with which the popular mind will warmly sympathize. But every scholar knows its value, as the vertebral column of an engineering course, and as affording much of the bone and sinew of any valuable instruction. For this work an abler teacher than the present incumbent is rarely found; a proposition rigorously demonstrated by the excellent results secured.

THE COLLEGE OF NATURAL SCIENCE.

The botanical and microscopical work continues its excellent and steady progress under Professor Burrill, who is ever surrounded by an eager company of workers. The new instrument which you ordered for the special researches of the Professor, is received, and is worthy of high praise. It fully illustrates the improvements of the compound microscope, made within late years, and is fitted with all the best devices for precision. We shall look confidently for a good report of its work under Prof. Burrill's manipulation.

Mr. Rolfe has given good assistance to Prof. Burrill in the subjects of botany and entomology.

The quality of the work done in the Chemical department, under Professors Weber and Scovell, has not materially changed since the new laboratory was opened.

A serious criticism rests against the Chemical courses, in one respect. If one examine the records of the University he will find that of the whole number of students who go to the laboratory, about one-fourth take chemistry one term; one-fourth, two terms; one-

fourth, three terms or a year; the remaining fourth more than one year—about five per cent. taking the full course of twelve terms. These fractions do not vary from the fact by more than two or three per cent. in any case, and are sufficiently near to illustrate the point in question. Exidently there are two great divisions of chemical students: one includes those who wish to make chemistry a business, in some of its special applications, as chemists, druggists, metallurgists, manufacturers, etc.; the other, those who desire a knowledge of the general outlines of chemistry, as are important, but not an absorbing part of a general education. The latter class, which is by far the larger in numbers, includes all the students in the courses of literature, science and art, with most of those in engineering, and some in agriculture. At least half, and probably three-fourths of the whole number belong to this class.

It is evident, therefore, that each of these great divisions should be provided for by a special course of chemistry adapted to its peculiar wants. It is farther evident that our admirably complete equipment in room, material and instructors makes such an arrangement eminently convenient and practical. The general student, who may not find time for more than one term of chemistry, amid the other necessary subjects of his course of study, ought to have a course adapted to him, and should not be put off with one-twelfth of a complete course which he can never follow through. There should be a shorter course in general chemistry, covering the outlines of the subject, in one term, say the long fall term. This course should consist of lessons or lectures, illustrated by the experiments of the professor. After that, if the pupil has time he might go into the laboratory and take as many terms of work there as his circumstances will permit.

It is not possible in six weeks of lectures and in eight weeks of laboratory to include enough of either theory or practice as to make any lasting impression. The pulpil learns a few elementary principles and performs a few of the simplest operations and then stops. He can go no farther because of other engagements, and he has failed to secure what he sought, because he has had to do work designed for a very different person and purpose. In evidence of the correctness of my position, I refer to the practice in most first class colleges, and to the judgment of both professors and students in this University, who have suffered either vicariously or personally for want of the facilities I have indicated. I am farther of opinion that such a preliminary term of chemistry would make a very excellent foundation on which to build a superstruction of the most enlarged character, even if, as it sometimes may, it should become the work of a lifetime.

It will be observed, however, that I do not contemplate or desire the curtailment of the very excellent and complete courses of chemistry now operative in the University, for such as seek instruction of that character. With right appreciation of the proper scope of the limited and the extended courses, each might be made to assist and supplement the other.

Your serious attention is called to the Department of Zoology and Geology. Inquiry should be directed to ascertain whether the present condition and administration of this department is such as its importance to the general plan of the University demands, and whether its development during the ten years past is such as it should exhibit, either for its own usefulness, or to keep pace with the progress of other departments of kindred nature.

If it should be found that deficiencies of grave import exist here, farther inquiry should be had as to the remedy which those deficiencies need.

THE COLLEGE OF LITERATURE AND SCIENCE.

This College attracts the larger number of students who come to us for general culture, not expecting to prepare themselves to any specific occupation. From the nature of the subjects taught in it, it is not easy to insist upon such an amount of previous study, as will have developed minds prepared to grapple with work of a university grade. A distinguished gentleman remarked that a certain subject was too hard for his boy, because the boy was too young. It was an admission that the boy was not prepared for the work he had undertaken. It is not easy, often is not possible, to give to youth in rural districts, or even in the higher village schools, the elementary training, the mental power which is needed to attack in a vigorous and effective manner any really solid college work. There is a difficulty here which every experienced educator will recognize. It is to find work that shall not be ephemeral and superficial, and shall yet have power to build the boy. Believing firmly in the efficacy of scientific study later in the education of youth, I am equally confident that science fails in the elementary stages, because the dilution necessary to prepare it for the child's reception makes it too feeble to answer its supposed purpose.

I believe if we could more positively insist on Latin as a prerequisite for admission to the school of English and Modern Languages, the result would be a decided gain. Nothing else seems so well fitted for the discipline and training needed at this preparatory stage. Its problems are such as the student can master. As a vehicle for learning language in general, and the English language in particular, it has no equal; proficiency in it will greatly relieve the subsequent labor of learning the French and German of our courses. No one can be said to have acquired a mastery of his own English tongue who has not somehow, and the more directly the more adequately, become a master of the significances found in the roots from which the dialects of science and literature are full.

The merits of our school of English and Modern Language seem scarcely to be appreciated beyond our own immediate circle. Professor Pickard has arranged a course of English language and literature, which has no superior within my knowledge. Professor Snyder is the rare example of a teacher of foreign birth who can successfully hold and train American students. Professor Crawford has found in history an excellent field, both for research and for instruction, and Mr. Charles E. Pickard is doing thorough work in Latin and Greek. In these courses the sciences cannot take the prominent places which they occupy in the technical courses, yet fill very essential places. In most cases

the instruction in science must be given to the students of this college with a scope and a significance quite different from that exhibited in the technical schools. It is this, more than anything else, that makes the difficulty in combining the work in the several departments of the University.

In concluding this notice of the work of the different colleges of the University, and of the instructors, I respectfully recommend that you refer to a committee the quest on whether any changes in the Faculty of this University are desirable, and that this committee report at the June meeting.

Of the additional schools I may farther say, that in the school of Art, Professor Roos is doing, as he has always done, good elementary work. His ambition to develop his school in the direction of industrial art and design is laudable, and should be fostered. The time is not near when a school of fine art can be supported in connection with this University. Professor Roos should have assistance from time to time in the purchase of models and objects for use in his school.

The school of Military Science has prospered during the year past. The replacing of the Junior class in the ranks will after this year give a larger list from which to select officers, and will give more efficiency to the service. With few exceptions the students take commendable interest in the drill, are punctual in attendance and obedient to authority.

The Preparatory class continues to diminish. New comers work their way from it to the Freshman class as fast as they can, in order to save the extra fees, and without any disparagement to the preparatory teachers, Messrs. Rolfe and Armstrong. The large amount of fees charged to students of this grade prevents increase of numbers. It was urged that the University would be the gainer if this class were discontinued, but as this question has been finally settled, I have no desire to re-open it. If then we are to continue the class, would it not be well to remove a part of the tariff restriction? I recommend that the tuition fee, $10 per term, be reduced to $5, leaving the incidental fee as it now stands. These pupils will then pay $12.50 per term instead of $17.50, or $37.50 per year instead of $52.50.

In this connection I would call your attention to a custom which exists, but which I fail to trace to any law or regulation, by which graduates, either with degrees or certificates, are allowed to continue their studies here without the payment of any fees at all. If this custom is to continue there should be some authority for it, although I fail to see a reason why such students should not pay their share of incidental expenses like others.

The Catalogue should soon be issued. No important changes are required in its matter. Ten classes have now graduated. I suggest that in the next issue the names of graduates be inserted, with their residences and occupations, so far as known. I farther recommend that authority be given to print an edition of 5,000 copies. I also call attention to the fact that the next Commencement is the tenth anniversary of the first graduating class, and that the alumni are preparing to make a general pilgrimage to the shrine of their alma-mater. Will it not be advisable to provide something in addition to the usual Commencement exercises which shall comport with the dignity of the occasion.

I recommend the following appropriations, with the list which will be furnished by the Business Agent:

For the Library, the balance of the State appropriation for the year	$500 00
For the Physical Laboratory, for renewal and repair of apparatus	100 00
For advertising	250 00

Respectfully submitted,

MARCH 14, 1882. S. H. PEABODY.

Adjourned to 7:30 P. M.

EVENING SESSION.

The Board met on time. Present as before.

A letter was received from Hon. T. T. Fountain, announcing his resignation as a member of the Board, and regretting that circumstances compelled such action.

The Regent's report was then taken up for consideration.

The recommendations concerning Departments were referred to a committee consisting of the President of the Board, Messrs. McLean, Millard and Bennett, with directions to report at the June meeting.

The tuition for the Preparatory Department was fixed at $5 per term, to take effect next academic year.

It was ruled that all students attending the University shall pay the regular incidental fees.

Five thousand copies of the Catalogue were ordered to be printed, and the Regent, Messrs Scott and Pearman were appointed a committee to revise and publish the Catalogue.

The following resolution was passed:

Resolved, That the suggestions of the Regent respecting Commencement Exercises next June, be referred to the Executive Committee and the Regent, with power to act.

The Business Agent submitted his report, which was received, and the vouchers were referred to an auditing committee, consisting of Messrs. McLean and Paden:

Current Appropriations.

Six monthts from September 1, 1881.	Appropri't'd	Receipts appro'ed.	Expended.	Balance.
Board expense	$300 00	.....	$189 28	$110 72
Salaries	11,820 00	.....	9,490 45	2,329 55
Fuel and light	2,800 00	$28 20	1,842 86	985 34
Stationery and printing	500 00	.....	424 62	75 36
Buildings and grounds	50 00	205 60	174 55	81 05
Fixtures and furniture	50 00	2 00	48 75	3 25
Military Department	150 00	.....	64 94	85 06
Library and apparatus	50 00	6 75	53 00	3 75
Incidental expense	200 00	.....	104 50	95 50
Mechanical Department	54 79	872 04	724 23	202 60
Architectural "	.....	2,479 06	2,177 31	301 75
Agricultural "	1,710 40	3,940 61	2,757 33	2,893 68
Horticultural "	352 12	139 28	276 03	215 37
Chemical "	140 62	937 52	979 80	98 30
Sundries—				
Physical laboratory	34 89	3 65	2 90	35 64
Students' government	17 75	.....	6 10	11 65
Engineering College	16 45	.....	16 45	.....
Examination of schools	42 43	.....	5 30	37 13
Tuition, Preparatory department	.....	1,330 50	1,230 00	100 50
Washington delegation	200 00	.....	111 15	88 85
New music books for choir	25 00	.....	19 05	5 95
Students' eating room	50 00	.....	46 65	3 35
Cabinets	.....	2 05	2 05	.....
Signal station	.....	.....	93 04	.....
OTHER RECEIPTS.				
Students' fees	.....	5,148 75	.....	.....
Illinois Central freight	.....	1,007 45	.....	.....

State Appropriations.

From July 1, 1881.	Appropri't'd	Received.	Expended.	Balance.
Taxes on lands, ½ per an	$5,000 00	$2,310 37	$2,310 37	.....
Buildings and grounds, ½ per an	5,000 00	2,500 00	2,929 96	.....
Chem., Phys. and Bot. Lab., ½ per an	1,600 00	800 00	326 03	$473 97
Mech. and Arcitect'l shops, ½ per an	3,000 00	1,500 00	1,008 29	491 71
Books and publications, ½ per an	3,000 00	1,500 00	510 90	989 10
Current expenses, ½ per an	11,400 00	5,700 00	5,700 00	.....
Library cases	800 00	800 00	602 52	197 48
Cabinets	1,000 00	1,000 00	454 74	545 26
Engineering instruments	1,000 00	1,000 00	657 45	342 55
Furniture	1,000 00	1,000 00	1,002 68	.....
Boiler House	5,000 00	5,000 00	4,936 82	63 18
Heating and ventilation	2,500 00	2,500 00	2,265 13	234 87
Farm Cottage and Dairy	1,000 00	1,000 00	1,000 08	.....

The following appropriations were made for the six months ending August 31, 1882:

Board expense	$300 00
Salaries	15,695 00
Fuel and light	1,000 00
Stationery and printing	700 00
Buildings and grounds	81 05
Fixtures and furniture	50 00
Library and apparatus	50 00
Incidental expense	200 00
Military department	125 00
Mechanical "	202 60
Architectural "	301 75
Agricultural "	2,894 68
Horticultural "	215 37
Chemical "	98 30
Sundries—Physical laboratory	35 64
Students' government	11 65
Examination of schools	37 13
Band books	5 95
Advertising	250 00
Photographic apparatus for Architectural Department	50 00
	$22,304 12

The following assignments were made from State appropriations: $500 for books and publications, and $100 for purchase of apparatus.

The Regent's report in regard to the better development of the facilities of the Mechanical Department, was referred to the Committee on Buildings and Grounds and the Regent.

To the Trustees of the Illinois Industrial University:

GENTLEMEN: At a meeting of your Executive Committee, held June 17th, 1879, it was resolved that the Professor of Mechanical Engineering be asked to present plans for systematizing and improving the elementary instruction in the Machine Shop. The changes which afterwards occurred in that department and in the University, have hitherto prevented a response to this request. The constantly increasing call for instruction in Mechanical Engineering, emphasizes a request for better facilities in carrying on that work.

It will scarcely be denied that the chief duty of the machine shop, like that of all the laboratories of the University, is to give instruction. Commercial work is mostly cut off from us—first, by the distance of the shop from the business centres of either of the adjacent cities, and, second, by the success of a shop in Champaign, where two of our graduates are building up a successful business. Our only regret at this change in the work of the shop, comes from the fact that we cannot now give to students who wish to support themselves in part by their own labor, as good an opportunity as in former days. It is, however, certain that the University cannot undertake any extensive scheme of manufacturing, even for the purpose of providing labor for the support of indigent students.

The class of beginners in the machine shop number, this term, seventeen persons. These students must work as a class at the same hours, in order that their shop-work may be kept out of the way of other class recitations, drill, etc. It is also evident, from a glance at the nature of the work, that but little of the teaching can be given to them as a class—like those, say, in a language, sitting before the teacher in a body, but the instruction must be brought to each separately, as he stands at his place at the work-bench.

The number of workers and the present supply of tools and distribution of room, necessitates an arrangement of work which is illogical and inconvenient, although it answered the purpose when there were fewer students to be trained. The students cannot all begin at the place which might, from its own nature, be thought most fit for a beginning, but a variety of work must be going on continually. Some begin at the pattern-shop, working on wood; some are put at the vises, chipping or filing; some at the machines, dressing wood or iron; some in the blacksmith's shop. The class is scattered through the works, and several trades are going on at once. Each pupil has a special problem, new to him, on which he needs frequent advice from his teacher, who, if he could be divided into several fragments, each endowed with the intelligence of a good workman, would become none too numerous for the duty required. The slight compensation in that a certain independence and self-reliance is cultivated, is more than over-balanced by waste of material, injury to tools, loss of time, and inculcation of bad methods. There is need, therefore, either of more teachers or of more tools. Ultimately there may be need for both; but increase of tools will meet the present difficulty, and it is evidently cheaper to furnish better facilities in rooms and tools than to undertake to pay more teaching force. It is evident that one teacher can easily and efficiently care for three times as many pupils if he can have them in one room, and employed on one kind of work, than if they were scattered through several apartments and occupied on different jobs. We have now in the pattern shops six sets of bench tools; at the iron-workers' benches eight vises and equipments; in the blacksmith's shop three fires and anvils: and in the machine shop eight machine tools. There should be, in the more elementary parts, at least fifteen sets of tools of the same general character, which might be made twenty at some future day.

That number would equip as large a class as should be taught at one exercise. More machines would also be desirable, but when the class comes to that stage of the work, division of tasks is more easily provided.

More tools require more room. In this respect we are yet fortunate that we have considerable room, now unoccupied, that can be made available, at a small expense for rearrangement. When the shops were first planned the best room, in the northwest corner, was reserved for a class-room. It has not been used for this purpose in several years, or indeed since the opening of more suitable rooms in the main building. It should be made useful as a shop room. To make this room available, and others more convenient, I would recommend the following changes.

1. The west stair-way to the drill hall to be arranged for a landing at the level of the second floor of the tower, and access to be given to the room on that floor by a door through the wall. This will permit the removal of the separate stair-case, which now uses part of the corner-room referred to.

2. The wooden partition at west end of pattern room to be moved up to the stair-case adding to the pattern shop the room now used as hallway. Rearrange the pattern racks by placing them on a gallery in the upper part of the room, and thus leave floor space for benches.

3. Cut a wide arch-way in the south-wall of the class-room; connecting that room with the main shop. This will give more work-room under easy supervision, and will improve the light in the main shop.

These changes, costing but little, may be made to add very much to the convenience of the rooms, and the ease of administration, and can be done from appropriations now in your command.

Professor Ricker thinks they may be done for one hundred dollars ($100.)

I would then inclose with walls and roof the space south of the machine shop to the car-track, as wide as the south-west tower—a space about 32x40 feet—for a blacksmith's shop. This would make room for a series of forge-fires about the wall, with working space in the center, giving as much opportunity for this work as would be needed. The smoke from these fires would be gathered by iron tubes to an iron stack placed against the wall of the drill hall, and extending above the roof. We have the tube which could be used for that purpose. This shop would be covered like the boiler-house with metal shingles, and would be lighted through the roof, and these roof lights may be so arranged that the light in the south end of the machine shop would not be seriously lessened. This extension would cost from $1300 to $2000, and legislative aid would be needed. I do not think the legislature would hesitate to respond to a call for aid of this nature.

I would then ask for the pattern shop nine (9) sets of carpenter's bench tools, at $10 per set, $90; for the machine shop, seven (7) vises with hammers, files, &c., at $10 per set, $70; benches and fixtures sufficient for use of such tools; say $30. I would provide a number of small lathes for wood turning, say six or eight. At the manual training school in the Polytechnic department of Washington University, at St. Louis, I saw such lathes that were thoroughly substantial and useful, furnished without shafting, at a cost of $30 per set. These tools might be made useful also for the woodshop, which is now sadly deficient in machinery of this sort.

The machine shop now needs one or more small engine lathes that would take work not more than 12 inches in diameter and two or three feet in length. The one we have which nearest answers this description is badly worn, and is not capable of doing really good work. We do not need large machines, but rather a multiplicity of smaller ones, which occupy but little room, and yet afford the means for teaching our boys how to use the machines of the most importance in the business they are learning.

I have developed this matter rather at length, not with the expectation that you will wish to pass upon them at this meeting, but to show what ends seem desirable, hoping that in time not far off some or all may be realized.

I am, very respectfully,

SELIM H. PEABODY,
Professor of Mechanical Engineering and Physics.

The following resolution was passed:

WHEREAS, This Board has received a letter from the Hon. T. T. Fountain, a former member of the Board, announcing his resignation; therefore,

Resolved, That this Board regret the action of Mr. Fountain, since his resignation deprives this Board of a genial gentleman and a valuable member, whose counsel and services have been eminently useful not alone to this body, but in the interest of higher education.

The Secretary was instructed to communicate this resolution to the Hon. T. T. Fountain.

The Committees on Rifle Range, Students' By-laws, and Fence and Painting, were continued.

Adjourned to [illegible] o'clock A. M.

SECOND DAY'S SESSION.

The Board met at 9:30 A. M. Present as before.

A communication from students in regard to secret fraternities was presented by Dr. Pearman. The petition was received and the Secretary instructed to notify the petitioners that the Board are not prepared to consider their request.

Election of officers being now in order, Mr. Scott was called to the chair.

On motion of Mr. Millard, seconded by Mr. McLean, Hon. Emory Cobb was nominated for President of the Board and unanimously elected.

The following were also re-elected unanimously:

Professor Edward Snyder, Recording Secretary.

Professor T. J. Burrill, Corresponding Secretary.

Professor S. W. Shattuck, Business Agent.

Messrs. Pearman and Scott were elected members of the Executive Committee.

Messrs. Bennett, McLean and Paden were appointed an Auditing Committee, to hold their office for one year.

The vacancy on the Farm Committee was filled by electing Dr. Pearman.

The Treasurer read his report, which was received and referred to the Auditing Committee:

JOHN W. BUNN, *Treasurer.*
In account with ILLINOIS INDUSTRIAL UNIVERSITY.

1882.		
Feb. 28.	By amount paid Board expense	$66 10
	" " " Salaries	4,107 04
	" " " on account buildings and grounds	123 30
	" " " " " Fuel and light	562 72
	" " " " " Stationery and printing	114 35
	" " " " " Library and apparatus	39 85
	" " " " " Incidental expenses	52 30
	" " " " " Military Department	5 94
	" " " " " Mechanical "	347 62
	" " " " " Architectural "	1,037 75
	" " " " " Agricultural "	1,241 12
	" " " " " Horticultural "	110 62
	" " " " " Chemical "	223 55
	State appropriations:	
	By amount paid on account buildings and grounds	784 77
	" " " " " Chem., Phys. and Bot. Laboratories	296 06
	" " " " " Mechanical and Architectural shops	409 89
	" " " " " Books and publications	307 13
	" " " " " Current expenses	3,560 00
	" " " " " Library cases	602 52
	" " " " " Cabinets	360 75
	" " " " " Furniture	48 33
	" " " " " Boiler House	29 76
	" " " " " Heating and ventilation	38 36
	By amount paid on account tuition in Preparatory Department	615 00
	" " " " " Washington delegation	111 15
	" " " " " New music for choir	19 05
	" " " " " Students' eating room	46 65
	" " " " " Cabinets	2 05
	" " " " " Signal station	93 04
	" " " " " Engineering	3 40
	" " " " " Students' government	6 10
	" " " " " Physical Laboratory	2 90
	By balance	9,223 43
		$24,592 60

Treasurer's Report—Continued.

JOHN W. BUNN, *Treasurer.*
In account with ILLINOIS INDUSTRIAL UNIVERSITY.

1881.		
Dec. 11.....	To balance.....	$11,194 84
1882.		
Jan. 2.....	By interest.....	1,080 00
" "	" " on Chicago 7 per cent. bonds.....	875 00
" "	" " Champaign County bonds.....	4,600 00
Feb. 28.....	By amount received on account of Architectural Department.....	1,374 22
" "	" " " " " Mechanical "	377 75
" "	" " " " " Agricultural "	1,445 27
" "	" " " " " Horticultural "	89 73
" "	" " " " " Chemical "	320 34
" "	" " " " " Buildings and grounds.....	153 60
" "	" " " " " Fuel and lights.....	28 20
" "	" " " " " Furniture and fixtures.....	2 00
" "	" " " " " Library and apparatus.....	5 00
" "	" " " " " Physical Laboratory.....	3 65
" "	" " " " " Cabinets.....	2 05
" "	" " " " " Fees.....	2,233 75
" "	" " " " " Tuition in Preparatory Dep't..	580 50
" "	" " " " " I. C. R. R. donation.....	226 70
		$24,592 60

Prof. Burrill's report, respecting the condition of the grounds around the site of the old Dormitory building and the creek in the aboretum, was referred to the Committee on Buildings and Grounds and the Regent, with power to act.

Dr. Pearman was appointed to fill the vacancy on Building Committee.

Mr. McLean made the following report:

To the Board of Trustees:

Your Auditing Committee would respectfully report that they have examined vouchers named in our report of December 14th, 1881, which were at that time not receipted, and find that all said vouchers have been duly paid and receipted, and recommend that the same be accepted and filed.

ALEXANDER McLEAN,
R. W. PADEN,
Committee.

The report was received and approved.

The Auditing Committee reported that the Treasurer's report and the vouchers Nos. 255 to 413, inclusive, had been examined and found correct. The report was accepted.

Adjourned.

E. SNYDER,
Secretary.

EMORY COBB,
President.

BOARD MEETING, JUNE 7, 1882.

The Board met in the University parlor at 3 o'clock P. M.

No quorum being present, adjourned to June 8, 1882, 8 o'clock A. M.

JUNE 8, 1882.

The Board met at 8:30 o'clock A. M.

Present—Messrs. Bennett, Cobb, Millard, Pearman and Scott.

Absent—Governor Cullom, Messrs. Bird, Mason, McLean and Paden.

The records of last meeting were read and approved.

The Treasurer read his report, which was received and placed on file:

ILLINOIS INDUSTRIAL UNIVERSITY,

To JOHN W. BUNN, *Treasurer*.

1882.	DR.		
May 31.....	To amount paid Board expense.....	$115 11	
	" amount paid salaries.....	7,563 98	
	" amount paid on account of buildings and grounds..	53 01	
	" amount paid on account fuel and lights.....	222 58	
	" amount paid on account stationery and printing....	297 00	
	" amount paid on account furniture and fixtures.....	1 85	
	" amount paid on account Mechanical Department...	112 58	
	" amount paid on account Architectural Department..	414 64	
	" amount paid on account Agricultural Department ..	1,792 02	
	" amount paid on account Horticultural Department.	400 33	
	" amount paid on account Chemical Department.....	340 74	
	" amount paid on account Military Department.....	36 44	
	" amount paid on account Library and apparatus.....	7 95	
	" amount paid on account incidental expenses.....	68 14	
			$11,426 37
	State appropriations—		
	To am't paid on acc't taxes on lands in Neb. and Minn.	$2,150 00	
	" amount paid on account buildings and grounds....	45 06	
	" amount paid on account Chem., Phys. and Bot. lab	338 16	
	" amount paid on account Mech. and Archt'l shops..	347 40	
	" amount paid on account books and publications...	631 62	
	" amount paid on account cabinets.....	22 50	
	" amount paid on account engineering instruments	39 48	
			3,574 22
	To amount paid on account band music.....	$4 41	
	" amount paid on account college government.....	9 25	
	" amount paid on account photograph apparatus.....	50 00	
	" amount paid on account examination of schools.....	12 90	
	" amount paid on account Physical laboratory.....	4 43	
	" amount paid on account tuition in Preparatory dept.	615 00	
			695 99
	Balance.....		929 41
			$16,625 99
	CR.		
1882.			
March 14...	By balance.....		$9,223 43
31...	" amount received on account fees.....	$1,545 00	
	" amount rec'd on acc't tuition in Preparatory Dep't..	326 25	
	" amount rec'd on acc't buildings and grounds.....	40 50	
			1,911 75
April 1.....	" interest on Douglas county School bonds.....		300 00
	" interest on $15,000.....		600 00
May 31.....	" amount received on acct. Mechanical Department..	$93 62	
	" amount received on acct. Architectural Dep't.....	157 05	
	" amount received on acct. Agricultural Department.	3,093 49	
	" amount received on acct. Horticultural Dep't.	324 82	
	" amount received on acct. Chemical Department....	273 76	
	" amount received on acct. fees.....	476 35	
	" amount received on acct. cabinets.....	9 45	
	" amount rec'd on acc't tuition in Preparatory Dep't..	70 00	
	" amount received on acct. buildings and grounds....	92 27	
			4,590 81
			$16,625 99

URBANA, June 6th, 1882.

JOHN W. BUNN, *Treasurer*.

The Regent's report was then read and received, and laid on the table until further consideration:

To the Trustees of the Illinois Industrial University:

GENTLEMEN:—Another collegiate year draws to a close. The eleventh class, numbering thirty-four persons, of whom four are young ladies, is ready for graduation. The Faculty recommend that degrees and certificates be conferred as follows:

Degree of Bachelor of Science, in the School of Mechanical Engineering—Andrew J. Eisenmayer, Charles N. Roberts, Abia J. Sharp, Frank Shlandeman, James Todd.

In the School of Civil Engineering—Robert E. Orr, George W. Richards.

In the School of Architecture—George W. Bullard, Arthur Peabody, Nelson S. Spencer.

In the School of Chemistry—Samuel G. Bailey, Jr., William B. Carman, Howard B. Slauson.

In the School of Natural History—Florizel A. Taft.

Degree of Bachelor of Arts, in the School of Ancient Languages—Samuel A. Harrison.

Degree of Bachelor of Letters, in the School of English and Modern Languages—Dora A. Andrews, Kitty C. Avery, Benjamin F. Bullard, David Eichberg, John R. Neely, Charles W. Palmer, Frederic D. Rugg, Charles L. Smith.

Award of Certificates—Arthur M. Bridge, Charles C. Barnes, Edward E. Cole, Fronia R Cole, William G. Curtiss, Jeptha H. Davis, Charles H. Merritt, Thomas Noble, Arvilla K Raley, Herbert Turner, John G. Wadsworth, Jr.

The Governor of the State has issued commissions to be Captains in the State Militia to the following persons: Samuel G. Bailey, Jr., Arthur M. Bridge, William M. Carman, Edward E. Cole, David Eichberg, Andrew J. Eisenmayer, Robert E. Orr, Abia J. Sharp, Charles L. Smith, Herbert Turner, John G. Wadsworth, Jr.

The attendance, and the character and quantity of work done, does not vary materially from that of former terms.

The report of classes and attendance is herewith appended:

Professor or Instructor.	No. classes	No. hours per week.	No. Pupils.			Remarks.
			Males	Fem.	Total.	
Selim H. Peabody	2	20	.....	.....	.....	.....
Thos. J. Burrill	3	15	15	9	24	Superintendent of Horticulture and Grounds
Samuel W. Shattuck	3	15	50	.....	50	Business Agent
Edward Snyder	5	25	107	43	150	Recording Secretary
Don Carlos Taft	3	15	36	10	46	Curator
Joseph C. Pickard	4	20	50	40	90	.....
N. Clifford Ricker	6	30	22	1	23	.....
Jas. D. Crawford	4	20	24	15	39	Librarian
Henry A. Weber	2	20	44	1	45	.....
George E. Morrow	1	5	4	.....	4	Superintendent of Farm
Frederick W. Prentice	2	8	16	.....	16	.....
Peter Roos	3	20	59	27	85	.....
William T. Wood	2	4	24	.....	24	Drill Master
Ira O. Baker	4	20	52	16	68	.....
Melville A. Scovell	.....	20	.....	.....	.....	Assistant in Chemical Laboratory
Chas. E. Pickard	4	20	36	6	42	.....
Cecil H. Peabody	2	19	10	.....	10	Assistant in Physical Laboratory
Edwin A. Kimball	2	20	18	.....	18	Foreman in Machine Shop
Jerome Sondericker	2	14	18	1	19	Assistant in Physical Laboratory
Nelson S. Spencer	1	10	4	.....	4	Foreman in Wood Shop
Chas. C. Barnes	.....	20	.....	.....	.....	Assistant in Chemical Laboratory
Chas. W. Rolfe	1	14	28	3	31	Assistant in Entomology
Jas. E. Armstrong	2	10	31	3	34	Taxidermist

The committee appointed at your last meeting to consider the needs of the University as to its corps of instructors will report through its Chairman, Mr. Millard.

Should any changes be made in the Department of Chemistry, I recommend the appointment of a Professor of Chemistry who should be a competent man of first class qualifications and extensive experience, and of a young man of good calibre and attainments as first assistant. The appointment of a Professor of Agricultural Chemistry might be deferred for the present, the instruction therein to be provided for by the Professor of Chemistry. Two second assistants will then be needed, with such help as may be found useful from senior students.

Mr. Charles E. Pickard has informed me that he does not desire a reappointment. His duties, while he has served as an instructor of English and modern languages, have been performed with notable fidelity, skill and success, and at his departure the University loses a very competent teacher. I respectfully suggest that the Board fill the vacancy thus formed by appointing an efficient woman who may find a suitable sphere as a teacher, and may fill the important relation toward the ladies attending the University, that has been vacant since the resignation of Mrs. Louisa A. Gregory.

In the Preparatory Department it will be possible to dispense with one instructor, if the Natural Philosophy be assigned to Prof. Cecil H. Peabody, who can carry it with the other work of his specialty.

Mr. Rolfe has done good service in this department and I recommend his appointmen for another year at a salary of $90 per month.

Provision should be made for another instructor if the class should be found larger than is now expected.

I nominate the following persons for reappointment in their several positions:

Cecil H. Peabody, Assistant Professor of Mechanical Engineering, Nelson S. Spencer, Foreman in the Architectural Shop, Jerome Sondericker, Instructor in Drawing, Howard Slauson, Assistant in Chemistry, Mrs. Abbie Wilkinson, Instructor in Vocal and Instrumental Music.

I take the liberty to remind the Board that Prof F. W. Prentice has been in their employ for the last ten years, continuously, that his chair is an important one, and that its duties have been always well discharged. Would it not be proper that his salary should be put on the same grade with that of full professors, at $1,800 per annum?

I present a request from Mr. W. B. Braucher, student-leader of the band. He will be satisfied with a moderate compensation; the duty is one requiring more than ordinary tact and attention, has been well performed for two years, and I think he should be paid.

I transmit a report from Prof. I. O. Baker asking for a small assignment for engineering instruments, and another upon the reconstruction of the Astronomical Observatory. They have been made after full consultation and I concur in each.

I present estimates from Prof. Ricker for repairing the ceiling of the upper story of the west wing of the main building. I recommend that this repair be made, and that the room be assigned for use as a Museum for the College of Engineering.

Authority should be given to the Mechanical Department for carrying forward such improvements in heating and ventilation as may be found feasible within the limit of the State appropriation for that purpose.

A communication concerning certain changes in the Machine Shop was referred at your last meeting to the Committee on Buildings and Grounds, whose report is presented for your concurrence.

I concur in the requests made by Prof. Ricker for appropriations for the Carpenter's Shop.

I desire to call your attention to the University printing office. The machinery and material therein were bought by funds raised in part by subscription and obtained in the larger part from an appropriation of the Legislature. Without doubt all this is the property of the State, and is under your care. As you have directed that all other movable property of the University should be inventoried at regular periods, it seems proper that the same regulation should apply to this.

For some years this property has been managed by the students, although there appears on record no order or authority for such use. The matter of its management, and of the publication of the "Illini," has become a source of some difference of opinion, not to say of bitterness, among the students. The paper itself, as a representative of the University, should receive attention. I suggest—

First: That the present business manager of the "Illini" be instructed to turn over to University the property of the printing office, and that a full inventory of the same be made and put on record, as provided in the case of other University property.

Second: That the subject be referred to a committee to report at your next meeting what rules, if any, are needed for the future conduct of this enterprise.

I have information that the students' society, known as the Scientific Association, has disbanded. The Adelphic Society asks permission to exchange its room for that formerly used by the Scientific Association.

The report of Prof. Morrow is herewith transmitted.

Profs. Roos, Ricker, Crawford and Prentice ask leave of absence during the summer vacation.

Respectfully submitted.

June 6, 1882. S. H. PEABODY.

ILLINOIS INDUSTRIAL UNIVERSITY,
June 2, 1882.

To the Regent and Board of Trustees of the Illinois Industrial University:

GENTLEMEN: I would very earnestly recommend that the services of Mr. N. S. Spencer be obtained for the next year, if possible, as foreman of the Architectural Shops.

Mr. Spencer has exhibited excellent qualities during his previous occupancy of this position, having been very faithful to the interests of the University, and also very successful as a manager and a teacher.

It is proposed, if it meets with your approval, and he is employed for the coming year, that he superintend the ordinary work of the shop and teach the classes in shop practice, as in the past; also, that the remainder of his time, which would probably be considerable, be devoted to the construction of a series of models of architectural constructions which are very urgently required for the instruction of the classes in elements of construction and graphical statics. I believe that a fairly complete series could be completed by Mr. Spencer during the year, and which would be new and original, adapted to the usual methods of construction, and far superior in its practical value as an aid for teaching purposes, to the models made in Europe, besides being a great deal cheaper. It will probably be the best opportunity for obtaining such a collection of models that will ever occur.

Very respectfully submitted,

N. CLIFFORD RICKER.

ILLINOIS INDUSTRIAL UNIVERSITY,
June 2, 1882.

To the Regent and Board of Trustees of the Illinois Industrial University:

GENTLEMEN: In behalf of the School of Architecture I beg to present the following recommendations for your consideration:

That the usual appropriation be made for the expenses of the classes in Architectural shop practice.

That $50 be appropriated for repairs of machinery.

That $25 be appropriated for whitewashing and painting the machinery room, like the carpenter's shop, to improve the light and appearance.

That $10 be appropriated for some new tools which are necessary.

That $20 be appropriated for materials for models of architectural constructions.

That a roll of tracing cloth be purchased for the use of the department. The cost will probably be about $10.

Very respectfully submitted.

N. CLIFFORD RICKER.

The following resolution was passed:

Resolved, That the recommendations of the Faculty as appears by the Regent's report, respecting Degrees and Certificates and persons entitled to the same, be approved, and that the Regent be authorized to confer the same.

Dr. Pearman made the following report:

To the Trustees of the Illinois Industrial University:

Your Committee on Buildings and Grounds report that they have considered the improvements suggested by the Regent for the arrangement of the Machine Shop, and they recommend that they be made at a cost not to exceed $100.

They suggest that the consideration of a plan for a new blacksmith shop be postponed till the next meeting.

They have ordered the erection of a plain fence along the west side of the arboretum, and have caused new posts to be placed at the west side of the campus, to correspond with those of the front fence. J. T. PEARMAN.

The Regent, from Committee on Commencement Exercises, reported that arrangements had been made and no expense incurred. The report was received.

The Regent, from Committee on Students' By-Laws, reported that the same had been revised and printed at an expense of $40. The report was approved.

The Regent further reported that 5,000 copies had been printed of the Catalogue of 1882, at a cost of $295. Approved.

The Committee on Rifle Range, also that on Painting, Shelters and Fence, were continued.

The Regent was authorized to employ a band leader for the next college year, at a compensation of $15 per term.

Leave of absence for vacation was granted to Professors Crawford, Ricker and Roos.

Adjourned to 3 P. M.

AFTERNOON SESSION.

The Board met on time. Present as before.

The Regent's report was taken from the table for consideration.

The following appointments were made for the ensuing academic year (of 10 months):

Professor Cecil H. Peabody, Assistant Professor in Mechanical Engineering, at $90 per month.

Mr. Charles W. Rolfe, Instructor in Botany and Mathematics, at $90 per month.

Mr. Jerome Sondericker, Instructor in R. L. Drawing, at $60 per month.

Mr. Nelson S. Spencer, Foreman of Architectural Shop, at $720 for twelve months, beginning July 1st, 1882,

Mr. Howard Slauson, Assistant in Chemical Laboratory, at $40 per month.

Mrs. Abbie Wilkinson, Teacher of Vocal and Instrumental Music, (fees for salary).

The salary of Dr. F. W. Prentice was advanced to $1,800 per annum.

Prof. Baker's request for engineering instruments and repairs, amounting to $60, was granted.

It was moved by Mr. Scott that the plans and specifications for an Astronomical Observatory, laid before the Board by Prof. Baker, be approved; that the building be erected at a cost not to exceed $450, and that its location be referred to the Committee on Buildings and Grounds, the Regent, and Prof. Baker. Carried.

It was moved and carried that $450 be devoted to repairing the ceiling of the upper story in west wing, said work to be done under the direction of the Committee on Buildings and Grounds, and that upon completion, the room be assigned as a Museum to the College of Engineering.

The Mechanical Department was directed to complete and repair the apparatus for heating and ventilation, the necessary expense to be taken from the State appropriation for the purpose.

Prof. Ricker's request for the sum of $115 for tools, materials and repairs in the Architectural Shops, was granted.

On motion of Mr. Bennett, the Regent was directed to take possession of all property belonging to the University in the Illini Printing Office, and to report to the Board at its next meeting such provisions and restrictions in regard to the future use of such property as he may deem proper.

It was moved and carried that the request of the Adelphic Society be granted by the Regent, upon satisfactory proof that the Scientific Association has disbanded and surrendered their hall.

Prof. Morrow's report was received and placed on file:

UNIVERSITY, JUNE 3, 1882.

Dr. S. H. Peabody, Regent:

I respectfully submit the following notes concerning work on the farms during the last three months:

With the exception of the results of the long continued cold and wet weather, which has greatly retarded the worn of corn planting, and made it necessary to replant some of the earliest planted, I am glad to be able to report a favorable condition.

We have planted about 110 acres to corn—about 20 acres designed for this crop being still unplanted. Of oats we have 35 acres, promising a good yield. On account of the unusual prevalence of chinch bugs, no wheat was sown, except experimental plats. These are looking well. Of rye we have some 65 acres, all seeded to grass and clover. The most of this was pastured last fall and this spring, proving of great service. There is now a promise of a fair yield on most, and a remarkably large yield on part of this acreage.

The meadows are promising, and the pastures, although possibly too fully stocked at present, are giving good feed.

With the exception of a colt seriously diseased, the live stock is nearly all in good condition.

In making sales, attention has been given to improving the character of the flocks by disposing of the less desirable animals. Some exchanges have been made with the same end in view.

It was found advisable to purchase a pair of mares for the farm. One of these, a finely bred Mambrino mare, has produced a promising colt.

The Short-horn herd is doing well. The young stock in general is better in quality than he older. A finely bred Rose of Sharon Short-horn bull calf has just been purchased at the sale of Pickrell, Thomas and Smith, for $270. He is regarded as a promising animal. A two-year-old Rose of Sharon Short-horn heifer was purchased at the sale of Mr. Gardner yesterday. Being rather thin in flesh it was obtained for $135. The herd now contains representatives of the following families, some of them ranking high: Rose of Sharon, Pearlette, Duchess of York, Young Mary Galatia, Ianthe, Red Rose, Arabella, Pansy and Zelia. The Jersey herd is still small, but is in good condition.

The steers being fed in testing different breeds, are doing well—making an average gain of nearly 100 pounds during May.

We are testing a large number of varieties of corn, sorghum and a few of oats, grass, etc., and are trying experiments in modes of planting, fertilizing, etc. It is purposed to use corn and sorghum in the silo.

The cash receipts for the past six months have been $4,390; those of the corresponding time last year were $1,779. It is not expected a like increase will appear for the last half of the year, but the indications now are that the year's work will give a satisfactory profit, with favorable weather. The leading items of sales have been cattle, $831; hogs, $897; butter and milk, $350; hay, $716; seed-corn, $769; feeding corn, $349; colt, $200; timothy seed, $178.

The sale of corn for seed has become an important branch of the farm sales, and one I consider especially appropriate. This line of work may be, as it seems to me, advisably extended.

I have thought it better to continue direct supervision of the work. Student T. F. Hunt, who assisted last year, has been of much help and will give his entire time during the summer vacation. The workmen, as a class, have done well.

We have laid about one and a half miles of hedge, which has been neglected for some years, and which we could not complete last year. Considerable repairing of board fences and some tile drainage has been done.

Respectfully submitted,

G. E. MORROW.

President Cobb reported verbally, as required by resolution of the Board, passed December 18, 1881, in regard to the course of Professors Weber and Scovell in obtaining patents. He said that he had received a oommunication from the Attorney-General to Governor Cullom, which he communicated and placed on file, and that the Attorney-General had given no further opinion upon the subject under consideration.

The report was accepted.

The following report from a special committee on the work of Departments, was made:

To the Honorable, the President and Board of Trustees of the Illinois Industrial University:

Your committee to whom was referred the recommendations of the Regent, in regard to the departments of the University, at the March meeting, 1882, beg leave to report that they have met and made such investigations into the several departments of the University as they could within the limited time they have had to devote to it.

That they find the several departments have in the main fulfilled the expectations of the Board and are performing practical and useful work.

Your committee further report that Professor Henry A. Weber and Melville A. Scovell in charge of the Department of Chemistry, have, as the Board is aware, assumed and claimed private rights in the results of their investigations and experiments in the manufacture of sugar, syrups and glucose from sorghum, which have for the last two years been conducted by them under the patronage of the University, and at the expense of the State.

Your committee report that in their opinion such claims are inconsistent with the duty of said Professors to the University and its rights. Therefore your committee recommend that the further services of Professors Weber and Scovell be dispensed with,

Your committee further report that Prof. D. C. Taft, of the Department of Geology and Zoology, has requested an indefinite leave of absence for the purpose of travel in Europe. They therefore recommend such leave of absence be granted, and for the purpose of relieving the Board from embarrassment in his department, recommend the chair of Geology and Zoology be declared vacant until further action of the Board.

S. M. MILLARD,
CHAS. BENNETT,
EMORY COBB,
Committee.

The following resolution was offered by Mr. Millard, seconded by Mr. Bennett:

Resolved, That the report of the Committee on Departments of the University be accepted and approved, and that the services of Professors Henry A. Weber and Melville A. Scovell, as professors in the University, be discontinued from the end of the present college year, ending September 1st, 1882.

The ayes and noes being called, the vote resulted as follows: Ayes, Messrs. Bennett, Cobb, Pearman, and Millard, 4. No, Mr. Scott, 1.

Carried.

It was moved by Mr. Millard, and seconded by Mr. Pearman,

Resolved, That the request of Prof. D. C. Taft for leave of absence for the ensuing year, be granted, and that the chair of Zoology and Geology be declared vacant until further order of the Board.

Carried.

The Regent was directed to report to this Board at its next meeting, or as soon as practicable, the names of two suitable persons, one as Professor of Geology and Zoology, and the other as Professor of Chemistry.

Adjourned to 10 P. M.

EVENING SESSION.

The Board met on time; present as before.

The report of the Business Agent was received and referred to the Auditing Committee:

Current Appropriations.

June 6, 1882.	Appropriated.	Receipts also approp'd.	Expended	Balance.
Board expense	$300 00	.....	$115 11	$184 89
Salaries	15,695 00	.....	7,563 98	8,131 02
Fuel and lights	1,000 00	.....	222 58	777 42
Stationery and printing	950 00	.....	297 00	653 00
Buildings and grounds	81 05	$132 77	53 01	160 81
Fixtures and furniture	50 00	.....	1 55	48 15
Library and apparatus	50 00	.....	7 95	40 05
Incidental expense	200 00	.....	68 14	131 86
Military Department	125 00	.....	36 44	88 56
Mechanical "	202 60	93 62	112 58	183 64
Architectural "	301 75	157 05	414 64	34 16
Agricultural "	2,894 68	3,093 49	1,792 02	4,169 15
Horticultural "	215 37	324 82	400 33	139 86
Chemical "	98 30	273 76	340 74	31 32
Sundries—Physical laboratory	35 64	.....	4 43	31 21
Students' government	11 65	.....	9 25	2 40
Examination of schools	37 13	.....	12 90	24 23
Band books	5 95	.....	4 41	1 54
Photo. apparatus for Arch. Dep't	50 00	.....	50 00	.....
Cabinets	.....	9 45	.....	9 45
Preparatory year	.....	396 25	695 99	.....
Students' fees	.....	2,021 35	.....	.....

State Appropriations.

From July 1, 1881.	Appropr'd	Received.	Expended	Balance.
Taxes on lands, ½ per annum	$5,000 00	$2,310 37	4,460 37	.....
Buildings and grounds, ½ per annum	5,000 00	2,500 00	2,975 02	.....
Chem., Phys. and Bot. laboratories, ½ per an.	1,600 00	800 00	664 19	$135 81
Mechanical and Architectural shops, ½ per an.	3,000 00	1,500 00	1,355 69	144 31
Books and publications, ½ per annum	3,000 00	1,500 00	1,142 52	357 48
Current expenses, ½ per annum	11,400 00	5,700 00	5,700 00	.....
Library cases	800 00	800 00	602 52	197 48
Cabinet	1,000 00	1,000 00	477 24	522 76
Engineering instruments	1,000 00	1,000 00	696 93	303 07
Furniture	1,000 00	1,000 00	1,000 00	.....
Boiler House	5,000 00	5,000 00	4,936 82	63 18
Heating and ventilation	2,500 00	2,500 00	2,265 13	234 87
Farm Cottage and Dairy	1,000 00	1,000 00	1,000 00	.....

A communication from Judge J. O. Cunningham concerning the Lansden case, with bill for services of $50, was received. On motion of Dr. Pearman, the bill was approved, and the Business Agent ordered to pay the amount.

The following report was received:

To the Hon. Board of Trustees:

Your Auditing Committee report that they have examined vouchers No. 414 to 602 inclusive, and find them all correct and properly receipted,

Except No. 442 ..... Error of two cents.
" " 506 ..... " ten dollars.
" " 512 ..... " eight cents.

All of which errors were against the Business Agent; also Nos. 494, 486, 515, not yet receipted, for satisfactory reasons as explained by the Business Agent.

Respectfully submitted.

CHAS. BENNETT, *Chairman Auditing Committee.*

The report was accepted and approved.

Adjourned.

E. SNYDER,
Secretary.

EMORY COBB,
President.

SEPTEMBER 12, 1882.

The Board met in the University parlor at 3:30 o'clock P. M.

No quorum being present, an adjournment was had to 8:30 A. M. next day.

SECOND DAY'S SESSION.

The Board convened at 8:30 A. M.

Present—Messrs. Cobb, Bennett, Mason, McLean, Pearman and Paden.

Absent—Governor Cullom, Messrs. Bird, Millard and Scott.

The minutes of last meeting were read and adopted.

The Regent then read his report, which was received.

To the Trustees of the Illinois Industrial University:

GENTLEMEN—The prosperous condition of business generally, and especially of the agricultural interests of our State, the increased inquiry for catalogues and other information, and the numbers which have appeared already, both of former students and of applicants for admission, all indicate an attendance larger than has been known here for some years.

An immediate duty is to provide adequate and competent instructors. To this subject I have given the most constant and careful attention, pursuant to instructions received from you at your last meeting, and I have now to present the following nominations:

For Professor of Chemistry, William McMurtrie, Ph.D., of Washington, D. C., late chief chemist of the Department of Agriculture. From the very strong endorsements given to Prof. McMurtrie by leading chemists at the East, from the record he has made while in the department as chief chemist, as Superintendent of Agriculture in the United States Section of the Paris Exposition of 1878, and as a specialist in working out important industrial problems at home, and from personal acquaintance, I am led to believe that the chemical instruction in this University will in no way suffer if committed to his charge.

For Professor of Zoology and Geology I name Benjamin C. Jillson, M. D., Ph. D., of Pittsburg, Pa. Dr. Jillson is a graduate of Yale College; he was employed on the geological survey of Tennessee; was Professor of Geology and Zoology in Tennessee, and afterward in the Western University of Pennsylvania; was for nine years Principal of the Pittsburgh High School, giving to it a character and fame of the first class. Dr. Jillson will bring to us sound learning, large experience, and a thorough knowledge of the wants of a department which waits for the hand of a master-builder.

Professor W. A. Kellerman, of the Agricultural College of Kentucky, at Lexington, presents strong recommendations, and would do good service.

For Instructor in Ancient Languages and Preceptress, I would name Miss Florence C. Perkins, now of the Cleveland High School. Miss Perkins is a graduate and valedictorian of Vassar College, and has been employed there as instructor in Latin and Greek. She has since made a good record in the High Schools of Burlington, Vt., and Cleveland, O. She brings evidence of ability to instruct in any line of work which we should desire to give her. Chiefly, however, I have sought a lady who would possess the tact and capacity to act as preceptress for the young ladies of the University. While the duties of this position may be less obtrusive, they will in fact be more important than the work of an instructor. The qualities needed will be peculiar and rare. I have not been able to secure elsewhere the same promise of excellence that she seems to possess.

Authority is asked that the Regent and the Professor of Chemistry may appoint one, and if it should seem needful, two second assistants in the Chemical Laboratory.

Authority is asked for the appointment of another instructor for the preparatory class, if the increased numbers of that class should require such assistance.

Also, that the Faculty may appoint an Instructor of Elocution on the same terms as for the last two years

I present the request of Mr. Kimball for an increase of salary. I can say no more in regard to it, than to express again the high opinion I have always held as to Mr. Kimball's usefulness in his present position, and to ask that you will give his request the consideration it deserves.

THE MACHINE SHOP.

The alterations therein have been made as authorized at your last meeting. It will now be possible to systematize the work more than heretofore, and thus to provide better for the constantly growing classes in this specialty. It is part of the same design that more tools should be added, and I ask an appropriation of $200 for that purpose.

I have had plans and estimates prepared for erecting an addition to the machine shop, to be used as a blacksmith's shop and foundry, to contain 16 fires, and to cost —— dollars. I suggest that the Legislature be asked to furnish the means for building this addition, with —— dollars for additional machinery and tools for the Mechanical and Architectural departments. These increased facilities are each year more imperatively needed, and I believe that such requests would meet a very cordial response.

THE LIBRARY.

The improvement authorized in this room has been made by constructing cases along the south and west walls, and by arranging the floor cases to form four alcoves at the south end. The accommodation for books has been increased by —— feet of shelving, with space for volumes. The nature of the improvement made it desirable to bring it to its present degree of completeness. The cost has exceeded the appropriation by $65.88, and the iron railing is left to be added at a future time.

An assignment of $1,000 is asked from the Library appropriation for the purchase of new books.

The repairs of the upper room in the west wing have been completed, and the room will be occupied by the College of Engineers for their museum, as soon as possible. While making these repairs it was found that a portion of the ceiling in the art gallery was in danger of falling, and by advice of the Executive Committee that has been taken down and replaced.

I present the usual report from the Professor of Agriculture.

I recommend that appropriations be made for the usual expenses of the next six months according to the list presented by the Business Agent.

Also, that $60 be granted for mattings for hall.

Progress has been made in the preparation of the inventories of apparatus and other movable property, as desired by you, but they cannot be completed before your next meeting.

Should the Alethenai Society so desire, I suggest that they be permitted the use of the room soon to be vacated by the Adelphic Society, and that the room finally left vacant be assigned for the use of the Young Men's Christian Association, with leave to use heat and gas.

I respectfully ask attention to the following subjects:

1. To a determination of the items to be asked of the next Legislature.

2. To a consideration of the means necessary to meet the financial necessities of the University, caused by the steady diminution in the income from the endowment.

Rspectfully submitted,

S. H. PEABODY, *Regent.*

On recommendation of the Regent, the following appointments were made:

Dr. William McMurtrie to be Professor of Chemistry for the present academic year, at a salary of $2,000 per annum; Dr. B. C. Jillson, to be Professor of Zoology and Geology for the present academic year, at a salary of $2,000 per annum; Miss Florence C. Perkins, to be Instructor in Ancient Languages and Preceptress, for the present academic year, at a salary of $1,200 per annum.

The Regent was authorized to employ a competent assistant, in case Miss Perkins could not accept the position.

The Regent and Professor of Chemistry were authorized to employ one, and if need be two assistants in the Chemical Laboratory, at a salary of $15 per month.

The Faculty were empowered to appoint an Instructor in Elocution, who is to receive the collected fees for his services.

Authority was given to the Regent to employ another instructor in the Preparatory Department, if necessary, salary not to exceed $40 per month.

The salary of Mr. E. A. Kimball, foreman of Mechanical Shop, was increased to $1,500 per annum. The salary of the Business Agent was fixed at $25 per month for the next six months.

The Treasurer's report was received, and referred to the Auditing Committee:

ILLINOIS INDUSTRIAL UNIVERSITY,

In account with JOHN W. BUNN, *Treasurer.*

	CR.		
1882.			
June 7	By balance		$929 41
	" Interest on Menard county bonds	$700 00	
	" " Leib's note	325 00	
15	" " Morgan county bonds	1,750 00	
July 1	" " Champaign county bonds	4,600 00	
	" " Pike county bonds	2,100 00	
	" " Sangamon county bonds	880 00	
	" " Chicago wakt. bonds	375 00	
	" " Kankakee school bonds	300 00	
			11,530 00
	By received from State, on account of—		
	Taxes on wild lands	$2,150 00	
	Buildings and grounds	2,500 00	
	Chem. Phys. and Bot. Laboratories	800 00	
	Mech. and Arch. shops	1,500 00	
	Current expense	5,700 00	
	Books and publications	1,500 00	
			14,150 00

Treasurer's Report—Continued.

Aug. 31	By received on account Mechanical department	$275 79	
	" " " Architectural "	1,336 29	
	" " " Agricultural "	359 99	
	" " " Horticultural "	234 80	
	" " " Chemical "	117 55	
	" " " Buildings and grounds	364 89	
	" " " Fuel and lights	49 40	
	" " " Stationery and printing	110 00	
	" " " Ill. Cen. Freight Donation	708 95	
	" " " Library and apparatus	50	
			$4,058 16
			$30,667 57
1882.	DR.		
August 31	To amount paid for Board expense	$73 42	
	" " " Salaries	7,143 79	
	" " " Buildings and grounds	233 07	
	" " " Fuel and lights	990 39	
	" " " Stationery and printing	560 92	
	" " " Mechanical Department	257 11	
	" " " Architectural Department	1,305 59	
	" " " Agricultural Department	2,638 79	
	" " " Horticultural Department	315 52	
	" " " Chemical Department	31 05	
	" " " Military Department	28 89	
	" " " Library and apparatus	42 08	
	" " " Incidental expense	114 18	
	" " " Sundry appropriations	52 65	
	" " " Fixtures and furniture	47 96	
			$13,835 41
	State appropriations—		
	" " " Buildings and grounds	$1,879 06	
	" " " Chem., Phys., and Bot. Lab	42 37	
	" " " Mech. and Arch. shops	283 60	
	" " " Books and publications	480 71	
	" " " Cabinets	6 50	
	" " " Engineering instruments	196 01	
	" " " Library cases	263 36	
	" " " Heating and ventilation	159 64	
	" " " Boiler house	4 50	
			3,315 75
	Balance—State current		13,516 41
			$30,667 57

URBANA, September 12th, 1881.

JOHN W. BUNN, *Treasurer.*

The following report was read:

ILLINOIS INDUSTRIAL UNIVERSITY, COLLEGE OF AGRICULTURE,
CHAMPAIGN, ILL., Sept. 11, 1882.

Dr. S. H. Peabody, Regent:

I am glad to be able to report the affairs of the farm, as a whole, in good condition. We harvested the grain crops and most of the hay in good condition. By measurements of the threshers, we have, in round numbers: Oats, 1,200 bushels; rye, 675 bushels; timothy seed, 100 bushels; wheat, 40 bushels. The latter small amount was of varieties being tested. Three of these are quite promising; well worthy of further trial. Most of the timothy seed has been sold, at $2.10 per bushel, a sale which now seems to have been a good one. At present prices it has not been thought advisable to sell any of the grain.

The hay crop was quite good. We have about 150 tons of good timothy hay, 30 tons of timothy straw, 30 of mixed hay of poorer quality, with a large quantity of straw.

The corn is almost a month later than last year. The result now depends entirely on the frost. A severe frost, even at first of next month, would greatly injure much of our crop. If sufficient time be given for it to mature, the larger part of the crop will be fully equal to that of last year. It is proposed to cut about 30 acres, if practicable seeding the ground to rye and grass this fall.

The unusual wet spring made it impossible to plant about ten acres designed for corn. This was sown to millet; but the growth of weeds was such as to make the crop practically a failure.

I have never known a more favorable season for grass and clover. The pastures have been fresh and green during all the summer, and are now in fine condition, excepting some weeds on new seeding.

We have plowed about 30 acres for rye and seven for wheat. During the present week it is purposed to fill our silo with corn.

With few exceptions the live stock has done well. I have purchased during the season, 16 head of calves and yearlings, as we had abundance of pasture and will have of "rough feed" for the winter. We have been feeding eight steers, comparing different breeds. These will be ready for sale this fall. It is also purposed to sell an equal number, mainly fattened on grass. A few cows may also be profitably sold. The dairy cows and calves have done well. We have had some trouble from a disease of the eyes, which, however, has usually done no permanent injury. We have had the misfortune to lose two or three calves, dropped prematurely.

I have purchased or exchanged a few pigs to improve our breeding stock, which I now count as fully satisfactory. We will have a fair number of pigs for sale for breeding purposes.

About five miles of hedges have been trimmed; some board fence has been reset; a change in the years at the experimental farm barn has increased the convenience and improved the appearance. A wagon shed has been built. The platform scales on the stock farm had been long in use, and were in bad condition; they have been exchanged for an improved pattern, in placing which in position there has been an annoying delay on the part of the contractor.

During the early part of the vacation, I attended a three days' meeting of Professors of Agriculture and Horticulture, at the Iowa Agricultural College. This was the third annual meeting of the Association, and was of interest and value. In company with Prof. Baker, I attended the second Farmers' Institute, held under the auspices of the State Board of Agriculture—this at Decatur.

I have accepted invitations to deliver addresses at one or two fairs and before the State Wool Growers' and State Swine Breeders' association during the State Fair at Peoria.

At the Champaign County Fair the farms made a somewhat full showing of horses, cattle, hogs, specimens of grain, etc.

Respectfully submitted,

G. E. MORROW, *Professor of Agriculture.*

The following special appropriations were made:

$200 from State appropriation for shops, for the purchase of tools for instruction of the classes in Shop Practice.

$65.88 from current funds to cover the deficiency in State appropriation for Library cases.

$60 from current funds, for purchase of matting for halls.

$255.72 from current funds, for payment of the Regent's traveling expenses, as per approved bill.

The following general appropriations were made from current funds for the six months ending February 28th, 1882:

Statement of Appropriations required for the Six Months ending February 28, 1883.

Board expense		$300 00
Salaries		12,000 00
Stationery and printing	$300 00	
Fuel and lights	2,000 00	
Buildings and grounds (balance)	292 63	
Furniture and fixtures	50 00	
Library and apparatus	50 00	
Incidental expense	200 00	
Military Department	50 00	
Mechanical Department, balance	202 32	
Architectural Department, balance	74 86	
Agricultural Department, balance	2,417 35	
Horticultural Department, balance	59 14	
Chemical Department, balance	117 82	
		5,814 12
Sundries—Physical Laboratory, balance	$30 96	
Cabinets	9 45	
Students' government	25 00	
Examination of schools	25 00	
		90 41
Total		$18,204 53

The recommendation contained in the Regent's report in regard to the assignment of rooms to societies, was approved.

On motion of Mr. McLean, a committee of five was appointed to present the wants of the University to the next Legislature. The Chairman of the Board, the Regent, Messrs. McLean, Pearman and Bennett, were so appointed.

The recommendations of the Regent as to the necessities of the University, were referred to the above committee.

The following report from the Executive Committee was received and approved:

CHAMPAIGN, ILL., September 12, 1882.

To the Trustees of the Illinois Industrial University:

The Executive Committee report that they have caused the following named repairs and improvements to be made, at the cost stated in each case respectively:

	Appropriation.		Cost.
Building Rifle Range	$100		$74 91
Building Front Fence	500		495 00
Painting Main Building	500	for Main Building	
Mechanical Building, Front Fence and Shelters	100	for Mechanical Building.	648 21
Plastering Mansard and Art Gallery	400	for Mansard	623 38
Building Library Cases	800		865 88

E. COBB,
J. T. PEARMAN,
J. R. SCOTT.

The following amendments of Article IV, Section 1, and of Article IX, Section 1, were proposed:

Resolved, That Article IV, Section 1, of By-Laws of this Board, be amended as follows: After the word President, in second line of said section, insert the words "Vice-President."

Resolved, That Article IX, Section 1, of the By-Laws of this Board, be amended: After word University, on seventh line of said section, insert the following: "It shall be the duty of the Vice-President, in the absence or other disability of the President of the Board, to perform all the duties of the President, as above set forth, in as full and ample manner as said President."

All the present members of the Board voting aye, they were declared adopted.

Hon. R. B. Mason was unanimously elected Vice-President.

The following report of the Business Agent was read and received:

Current Appropriations.

September 12th, 1882.	Appropriated.	Receipts also appropriated.	Expended	Balance.
Board expense	$300 00		$188 53	$111 47
Salaries	15,695 00		14,707 77	987 23
Fuel and lights	1,000 00	$49 40	1,212 97	
Stationery and printing	950 00	110 00	857 92	202 08
Buildings and grounds	81 05	497 66	286 08	292 63
Fixtures and furniture	50 00		49 81	19
Library and apparatus	50 00	50	50 03	47
Incidental expense	200 00		132 32	17 68
Military Department	125 00		65 33	59 67
Mechanical Department	202 60	369 41	369 69	202 32
Architectural Department	301 75	1,493 34	1,720 23	74 86
Agricultural Department	2,894 68	3,953 48	4,430 81	2,417 35
Horticultural Department	215 37	559 62	715 85	59 14
Chemical Department	98 30	391 31	371 79	117 82
Sundries—Physical Laboratory	35 64		4 68	30 69
Students' government	11 65		11 65	
Examination of schools	37 13		12 90	24 23
Band books	5 95		4 41	1 54
Phot. appliances for Arch. Dep't	50 00		50 00	
Cabinets		9 45		9 45
Preparatory year		411 25	615 00	
J. O. Cunningham's fee	50 00		50 00	
Students' fees		2,043 85		

State Appropriations.

From July 1st, 1881.	Appropriated.	Received.	Expended	Balance.
Taxes on Lands—½ per annum	$5,000 00	$4,460 37	$4,460 37	.....
Buildings and grounds—½ per annum	5,000 00	5,000 00	4,854 08	$145 92
Chem., Phys. and Bot. Laboratories—½ per an	1,600 00	1,600 00	706 56	893 44
Mechanical and Architectural shops—½ per an	3,000 00	3,000 00	1,639 49	1,360 71
Books and publications—½ per annum	3,000 00	3,000 00	1,623 23	1,376 77
Current expenses—½ per annum	11,400 00	11,400 00	5,700 00	5,700 00
Library cases	800 00	800 00	865 88	.....
Cabinets	1,000 00	1,000 00	483 74	516 20
Engineering instruments	1,000 00	1,000 00	886 94	113 06
Furniture	1,000 00	1,000 00	1,000 00	.....
Boiler house	5,000 00	5,000 00	4,941 32	58 68
Heating and ventilation	2,500 00	2,500 00	2,424 77	75 23
Farm Cottage and Dairy	1,000 00	1,000 00	1,000 00	.....

The following resolutions in regard to the University Printing Office were passed:

WHEREAS, The press, type, cases and other material in the printing office in the Mechanical building are the property of the University, subject to the control of the Trustees,

Resolved, That the Regent and Faculty be, and they are hereby requested to maintain constant supervision over said property; to permit its use by such students only as they approve, under such regulations as they may prescribe, and to reclaim it whenever in their judgment the interests of the University require such action.

Recess taken until 2:30 P. M.

AFTERNOON SESSION.

The Board met as by adjournment. Present as before.

The Corresponding Secretary, Prof. T. J. Burrill, laid before the Board the proceedings and papers to be published by the State as the biennial report of this University.

On motion of Mr. McLean, the report was received and ordered to be forwarded to the Governor.

The Auditing Committee made the following report:

To the Board of Trustees of the Illinois Industrial University:

The undersigned respectfully report that they have examined vouchers for which warrants have been issued, from No. 603 to 775 inclusive, and find the same correct.

ALEX. McLEAN,
CHAS. BENNETT.

The committee also reported back the Treasurer's report as correct, and it was ordered to be placed on file.

Adjourned.

E. SNYDER,
Secretary.

EMORY COBB,
President.

List of Vouchers.

No.	To whom.	For what.	Amount.
1	R. B. Mason	Expenses to September meeting	$5 00
2	Alexander McLean	" " " "	26 30
3	S. M. Millard	" " " "	18 50
4	Charles Bennett	" " " "	5 28
5	Ebenezer Fryer	Masonry for smoke stack	144 84
6	Anglo-American Roofing Co	Metallic shingles	284 60
7	J. J. Kerr	Mason work	16 27
8	M. W. Lacy	Hauling, etc	235 37
9	Larrabee & North	Hardware	40 35
10	S. H. Peabody	Salary, September, 1880	250 00
11	T. J. Burrill	" "	150 00
12	S. W. Shattuck	" "	150 00
13	E. Snyder	" "	150 00
14	D. C. Taft	" "	150 00
15	J. C. Pickard	" "	150 00
16	N. C. Ricker	" "	150 00
17	J. D. Crawford	" "	150 00
18	H. A. Weber	" "	150 00
19	G. E. Morrow	" "	150 00
20	F. W. Prentice	" "	125 00
21	P. Ross	" "	100 00
22	I. O. Baker	" "	125 00
23	M. A. Scovell	" "	100 00
24	C. H. Peabody	" "	90 00
25	C. E. Pickard	" "	90 00
26	E. A. Kimball	" "	110 00
27	Jerome Sondericker	" "	60 00
28	N. S. Spencer	" "	50 00
29	C. W. Rolfe	" "	75 00
30	J. E. Armstrong	" "	40 00
31	C. C. Barnes	" "	40 00
32	A. B. Baker	" "	50 00
33	L. B. and W. Ry	Freights	31 50
34	Adelphic Society	Use of piano, Commencement	5 00
35	Indianapolis Journal	Advertising	9 84
36	R. S. Wilber	Hauling	61 00
37	E. S. Ritchie & Son	Apparatus	22 50
38	Fuller & Fuller	Glass and putty	18 42
39	Fuller & Fuller	Hard oil-finish	8 00
40	D. E. McHenry	Gate fixture	1 50
41	Theodore Kalb	Assayer's lead	3 50
42	"Illini"	Printing	5 50
43	Lester Horn	Four days' labor	4 00
44	E. B. Benjamin	Chemicals	553 11
45	N. A. Williams	Fire brick, clay, etc	185 00
46	Western Rural	Advertising	17 28
47	Courier-Journal	Advertising	35 10
48	Thomas Kerr	Mason work	228 50
49	Thomas Kerr	Mason work	6 88
50	J. H. W. Collins	Painting	15 50
51	D. Appleton & Co	Book	6 00
52	A. H. Andrews & Co	Desks	153 00
53	T. Haughton	Mats for class pictures	4 00
54	J. Bacon	55 30-56 bushels rye	58 30
55	Springfield Journal	Advertising	11 00
56	A. B. Davis	31½ yards sand	31 50
57	E. Cobb	Expenses at meetings	11 50
58	R. B. Harmel	Painting	31 50
59	James V. White	17 1-10 days' work	21 38
60	W. T. Pratt	25 days' painting	50 00
61	S. E. Weeks	2,000 brick	16 00
62	George W. Parker	18½ days' work	37 00
63	Emmett Cole	25 days' painting	37 50
64	Samuel Roughton	13 days' work	19 50
65	Grace Peabody	Salary and clerk, two months	19 68
66	Enterprise Coal Co	One car coal	24 00
67	R. B. Harmel	Work on blackboard	8 75
68	Warren Maltby	Repairing organ	2 00
69	Agricultural Department	Farm expenses, September	241 55
70	Wm. Roysdon	Moving brige	4 00
71	F. W. Story	Advertising	27 30
72	J. Bacon	52 18-56 bushels rye	54 93
73	J. G. Clark	1 Jersey cow	40 00
74	Students' labor pay-roll	Roll for September	285 82
75	S. H. Peabody	Salary, October, 1881	250 00
76	T. J. Burrill	" "	150 00
77	S. W. Shattuck	" "	150 00
78	E. Snyder	" "	150 00

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
79	D. C. Taft	Salary, October, 1881	$150 00
80	J. C. Pickard	" "	150 00
81	N. C. Ricker	" "	150 00
82	J. D. Crawford	" "	150 00
83	H. A. Weber	" "	150 00
84	G. E. Morrow	" "	150 00
85	F. W. Prentice	" "	125 00
86	P. Roos	" "	100 00
87	I. O. Baker	" "	125 00
88	M. A. Scovell	" "	100 00
89	C. H. Peabody	" "	90 00
90	C. E. Pickard	" "	90 00
91	J. Sondericker	" "	60 00
92	E. A. Kimball	" "	110 00
93	N. S. Spencer	" "	50 00
94	C. W. Rolfe	" "	75 00
95	J. E. Armstrong	" "	40 00
96	C. C. Barnes	" "	40 00
97	A. B. Baker	" "	50 00
98	Larrabee & North	Tools, etc	24 45
99	Palmer, Fuller & Co	Sash	63 81
100	Adolph Sturne	Veneering	49 84
101	G. W. Davidson	Teaming	3 00
102	C. H. Merritt	5¾ days' painting	8 63
103	General Association of Illinois	Advertising	10 00
104	A. C. Armstrong & Son	Books	25 00
105	L. H. Walden	Work	31 12
106	W. D. Kennady	Plastering	39 00
107	Anton Iten	Work	33 37
108	Robeson Bros	Toweling	1 50
109	J. P. Pickard	Work on grounds	9 69
110	S. E. Weeks	3,000 brick	24 00
111	J. Hamilton & Co	Lumber	22 56
112	J. D. White	23 days' work	28 75
113	C. I. C. R. R	Advanced freight	1 70
114	H. B. Slauson	Salary, September and October	20 00
115	Henry Peeper	2 days' work	2 00
116	Anton Iten	Work on grading	32 67
117	G. W. Parker	30¾ days' work	60 75
118	Sam'l Roughton	Work on pipes, etc	28 50
119	Sutton & Sheldon	23,300 brick	186 40
120	Sutton & Sheldon	12,000 brick	108 00
121	E. L. Wakeman	Advertising	60 00
122	W. T. Pratt	23¾ days' painting	47 50
123	Trevett Bros	Hardware, etc	49 10
124	N. S. Spencer	Work, Architectural shops	29 00
125	Oliver Bros. & Phillips	617 iron pickets	155 49
126	L. C. Garwood	Target, rifle and balls	10 90
127	Samuel Roughton	Fireman, October	10 50
128	Agricultural Department	Farm expenses, October	391 04
129	A. U. Bannard	1 pig	12 50
130	W. F. & J. Barnes	Former and knives	31 20
131	C. & U. Gas Co	Gas, October, 1881	120 30
132	Fuller & Fuller	Glass	22 46
133	J. B. Sims	Teaming	3 00
134	Julius Wilskey	Mason work	4 50
135	A. B. Davis	7 yards sand and gravel	7 00
136	R. B. Harmel	Painting	43 28
137	R. B. Harmel	Painting	10 00
138	J. C. Lewis	Mason work	6 25
139	Illini	Printing	4 50
140	George Eli	Blacksmithing	24 00
141	Palmer, Fuller & Co	Rail and balusters	37 00
142	Grace Peabody	Clerk Regent's office	13 18
143	E. B. Benjamin	Chemicals	6 44
144	Beasley & Macey	Plastering	8 50
145	Ford, Johnson & Co	Chairs	67 50
146	Thomas Kerr	Building chimney	265 00
147	H. Peddicord	Lime and cement	1 80
148	Emmett Cole	11 days' painting	16 50
149	Chicago White Lead Co	Lead and oil	79 90
150	Cameron, Amberg & Co	Stub tiles	3 70
151	Palmer, Fuller & Co	Doors	14 50
152	S. W. Shattuck	Students' labor pay-roll	270 24
153	S. H. Peabody	Salary, November, 1881	250 00
154	T. J. Burrill	" "	150 00
155	S. W. Shattuck	" "	150 00
156	E. Snyder	" "	150 00

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
157	D. C. Taft	Salary, November, 1881	$150 00
158	J. C. Pickard,	" "	150 00
159	N. C. Ricker	" "	150 00
160	J. D. Crawford	" "	150 00
161	H. A. Weber	" "	150 00
162	G. E. Morrow	" "	150 00
163	F. W. Prentice	" "	125 00
164	P. Roos	" "	100 00
165	I. O. Baker	" "	125 00
166	M. A. Scovell	" "	100 00
167	C. H. Peabody	" "	90 00
168	C. E. Pickard	" "	90 00
169	E. A. Kimball	" "	110 00
170	J. Sondericker	" "	60 00
171	N. S. Spencer	" "	50 00
172	C. W. Rolfe	" "	75 00
173	J. E. Armstrong	" "	40 00
174	C. C. Barnes	" "	40 00
175	A. B. Baker	" "	50 00
176	J. C. Vaugn	Seed and bulbs	12 13
177	Illinois Central Railroad	Advanced freights	5 53
178	W. T. Pratt	Painting	3 00
179	Abendroth & Root Manf'g Co	Pipe heads	4 50
180	W. T. Pratt	Painting	38 00
181	Christian Green	Work on grounds	6 88
182	A. H. Andrews	Lumber and slating	70 92
183	I. B. and W. Railway	Freight on iron pickets	13 61
184	U. S. Patent Office	Binding reports	15 60
185	Besore & Co	Lumber and lime	65 07
186	Ford, Johnson, & Co	1 dozen chairs	10 00
187	Lyon & Healey	Repairing Instruments	6 50
188	Henry & Kariher	Paint brushes	32 00
189	Thomas Hughes	Teaming	24 07
190	Central Telephone Co	Telephone Exchange service	8 75
191	Jansen, McClurg & Co	Books	31 50
192	Barclay Coal Mining Co	Coal, 10 cars	207 00
193	Horticultural Department	Expenses in department	16 84
194	Agricultural Department	Work, &c., 3 months	10 28
195	" "	Work for other departments	48 20
196	Crane Bros. Manf'g Co	Pipe and labor	8 51
197	" " "	Chuck and iron	12 18
198	Robinson & Burr	Repairs	15 75
199	M. E. Lapham	Lumber	55 64
200	Robinson & Burr	Labor and materials	19 54
201	Thomas Wright	Castings	40 71
202	Thomas Wright	Sash weights	12 80
203	M. E. Lapham	Lumber for fence	82 34
204	S. W. Shattuck	Students' labor pay-roll, November, '81	241 65
205	Trevett & Green	Hardware	24 81
206	Trevett & Green	Valley conductor, &c	81 05
207	Trevett & Green	Repairs, &c	10 11
208	Thomas Hughes	Teaming	12 38
209	T. J. Burrill	Salary as Secretary, 3 months	50 00
210	Grace Peabody	Salary as Regent's clerk	12 75
211	Ervini Ray	Work on grounds	4 38
212	Christian Green	Work on grounds	6 93
213	H. Swannell	Paints	11 47
214	H. Swannell	Drugs, lead, &c	16 94
215	C. & N. Gas L. & C. Co	Gas for November, 1881	61 20
216	F. Cloyd	Work on grounds	4 38
217	Samuel Roughton	Fireman, main building	39 00
218	A. Iten	Work on walks	31 13
219	C. Rush	Carpenter work	47 30
220	George W. Parker	Carpenter work	43 65
221	J. C. Pecard	Work on fences	18 75
222	James White	Shoveling coal	5 00
223	John Stewart	Teaming	37 13
224	H. Peeper	Work on grounds	1 00
225	T. J. Burrill	Book	1 80
226	Miller & Hunt	Flower pots and plants	15 45
227	A. E. Butts	Work in Botanical Laboratory	55
228	H. Slauson	Assistant in Chemical Laboratory	10 00
229	R. B. Harmell	Painting	58 19
230	R. B. Harmell	Painting	10 50
231	Champaign County Gazette	Printing and materials	105 55
232	Champaign County Gazette	Binding books	112 50
233	Trevett Bros	Hardware	11 36
234	Henry Horn	Coal, 12 cars	303 75

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
235	J. E. Saxton	Wrapping paper, etc	$1 30
236	John Hatcher	Teaming	20 63
237	George E. Morrow	Salary as farm superintendent, 3 mos.	50 00
238	James Whele	Work, grading, etc	19 50
239	Crane Bros. Manf'g Co	Heaters, pipes, etc	97 21
240	Agricultural department	Farm expenses, November, 1881	438 11
241	Crane Bros. Manf'g Co	Connecting pipes, etc	500 43
242	Ills. Cent. R. R. donation	Freights, Sept., Oct. and Nov	780 35
243	Architectural department	Work and materials	822 38
244	Houghton, Mifflin & Co	Books	5 87
245	Thomas Kerr	Mason work	55 58
246	Mechanical department	Work for other departments	106 26
247	Mechanical department	" " " (St.)	327 97
248	Architectural department	" " "	82 29
249	Thomas Kerr	Mason work	5 87
250	S. W. Shattuck	Salary as Business Agent 3 months	50 00
251	Edw. Snyder	" Rec. Secretary "	50 00
252	S. H. Peabody	Expenses	6 55
253	E. N. McAllister	Postage, 3 months	65 00
254	S. W. Shattuck	Petty expenses, 3 months	33 20
255	R. B. Mason	Expenses to November meeting	4 00
256	Alexander McLean	" " " "	23 90
257	Chas Bennett	" " " "	5 75
258	R. N. Peden	" " " "	12 60
259	S. M. Millard	" " " "	19 85
260	John Stewart	Teaming	19 25
261	A. Barr	Hard lumber	39 56
262	Abbie Wilkinson	Salary as organist	12 50
263	Wm. B. Carman	" " Choir leader	12 50
264	G. C. Willis	Table cloths	18 75
265	S. H. Peabody	Salary, December, 1881	250 00
266	T. J. Burrill	" "	150 00
267	S. W. Shattuck	" "	150 00
268	E. Snyder	" "	150 00
269	D. C. Taft	" "	150 00
270	J. C. Pickard	" "	150 00
271	N. C. Ricker	" "	150 00
272	J. D. Crawford	" "	150 00
273	H. A. Weber	" "	150 00
274	G. E. Morrow	" "	150 00
275	F. W. Prentice	" "	125 00
276	P. Roos	" "	100 00
277	I. O. Baker	" "	125 00
278	M. A. Scovell	" "	100 00
279	C. H. Peabody	" "	90 00
280	C. E. Pickard	" "	90 00
281	E. A. Kimball	" "	110 00
282	J. Sondericker	" "	60 00
283	N. S. Spencer	" "	50 00
284	C. W. Rolfe	" "	75 00
285	J. E. Armstrong	" "	40 00
286	C. C. Barnes	" "	40 00
287	A. B. Baker	" "	50 00
288	M. Myers	Painting 7½ days	7 50
289	Grace Peabody	Regent's clerk	12 13
290	J. P. Stewart	Work with team	16 50
291	Sam'l Roughton	Salary as fireman Dec., 1881	40 50
292	J. Pecard	3¼ days' work	4 06
293	Clark Rush	246-10 " "	49 20
294	Allen & Bailey	Herd books	15 00
295	Irvin Ray	5 days' work	6 25
296	P. McDonald	8 " "	8 75
297	August Ikelberg	3½ " "	3 50
298	A. B. Baker	Petty expenses	3 20
299	L. G. Bronson	Work with team	6 00
300	P. McDonald	2 days' work	2 50
301	S. W. Shattuck	Students' pay roll, December	210 35
302	Marshall Field & Co	Curtains and mats	43 95
303	Vittum Bros	Plates and glasses	9 90
304	D. C. Taft	Petty expenses	5 75
305	Peterson & Lloyde	Stationery	2 75
306	A. Iten	18 days' work	27 00
307	Thos. Hughes	½ day's work with team	1 38
308	Champaign Gas Co	Gas for December	42 90
309	John S. Stott	Stationery	22 95
310	H. Parker	Work on new fence	3 00
311	W. T. Pratt	Repairs on roof	23 00
312	Heath & Milligan	2 bbls. sand	4 35

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
313	R. B. Harmel	Painting	$37 63
314	Thos. Wright	Castings	35 56
315	Henry Horn	Coal	30 00
316	R. B. Harmel	Painting	4 38
317	Larrabee & North	Hardware	60 40
318	N. S. Spencer	Extra work in shop	15 00
319	"The Illini"	Printing and advertising	16 65
320	Geo. Parker	21 5-10 days' work	48 37
321	Geo. E. Morrow	Expense to Washington	55 40
322	S. H. Peabody	Salary, January, 1882	250 00
323	T. J. Burrill	" "	150 00
324	S. W. Shattuck	" "	150 00
325	E. Snyder	" "	150 00
326	D. C. Taft	" "	150 00
327	J. C. Pickard	" "	150 00
328	N. C. Ricker	" "	150 00
329	J. D. Crawford	" "	150 00
330	H. A. Weber	" "	150 00
331	G. E. Morrow	" "	150 00
332	F. W. Prentice	" "	125 00
333	P. Roos	" "	100 00
334	I. O. Baker	" "	125 00
335	M. A. Scovell	" "	100 00
336	C. H. Peabody	" "	90 00
337	E. A. Kimball	" "	110 00
338	C. E. Pickard	" "	90 00
339	J. Sondericker	" "	60 00
340	N. S. Spencer	" "	50 00
341	C. W. Rolfe	" "	75 00
342	J. E. Armstrong	" "	40 00
343	C. C. Barnes	" "	40 00
344	A. B. Baker	" "	40 00
345	Agricultural Department	Farm expenses, December, 1881	182 60
346	" "	" " January, 1882	335 00
347	Rosevdt, Field	Collection of fossils	350 00
348	A. W. Parker	Work in shop	50 40
349	Samuel Roughton	Salary as fireman, January	45 00
350	Samuel Roughton, Jr	Night firing and shop, January	11 35
351	Grace Peabody	Regent's clerk	12 62
352	S. H. Peabody	Expenses to Agricultural Convention	55 75
353	Central Telephone Co	Services first quarter, 1882	15 00
354	Springfield Daily Journal	Subscription, 1881	4 00
355	R. B. Harmel	Painting	5 25
356	"The Illini."	Printing	5 75
357	I., B. & W. Railway	Freights	29 61
358	R. B. Harmel	Painting	17 50
359	E. B. Benjamin	Chemicals	56 05
360	Stearns & Co.	Barrel of stucco	2 25
361	R. & J. Beck	Microscope apparatus	28 80
362	Crosby Steam Valve Co	Steam indicator	60 00
363	Fuller & Fuller	Chemicals	8 82
364	J. B. Sims	Wagon, etc	40 00
365	S. W. Shattuck	Students' pay roll, January, 1881	180 34
566	S. H. Peabody	Salary, Feb'y 1882	250 00
367	T. J. Burrill	" "	150 00
368	S. W. Shattuck	" "	150 00
369	Edw. Snyder	" "	150 00
370	D. C. Taft	" "	150 00
371	J. C. Pickard	" "	150 00
372	N. C. Ricker	" "	150 00
373	H. A. Weber	" "	150 00
374	J. D. Crawford	" "	150 00
375	G. E. Morrow	" "	150 00
376	F. W. Prentice	" "	125 00
377	P. Roos	" "	100 00
378	I. O. Baker	" "	125 00
379	M. A. Scovell	" "	100 00
380	C. H. Peabody	" "	90 00
381	C. E. Pickard	" "	90 00
382	E. A. Kimball	" "	110 00
383	J. Sondericker	" "	60 00
384	N. S. Spencer	" "	50 00
385	C. W. Rolfe	" "	75 00
386	J. E. Armstrong	" "	40 00
387	C. C. Barnes	" "	40 00
388	A. B. Baker	" "	60 00
389	G. W. Parker	Work in shop	53 66
390	The Herald	Printing	6 00

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
391	A. B. Baker	Pay of women, cleaning	$30 40
392	C. Rush	Work in Arch. shop	93 35
393	Jas. V. White	Labor on grounds, etc	18 12
394	Thos. Wright & Son	Castings	8 12
395	A. R. Buckles	Plumbing	33 14
396	Thos Hatch	Telegraph line for Signal Station	83 74
397	E. G. Holton	Priming trees and hedge	9 06
398	S. H. Van Pelten	Record book, etc	6 10
399	Noah Myers	Work on Cottage	10 00
400	Brown & Co	Vol. 13 Encyl. Brit	5 50
401	Mrs. Abbie Wilkinson	Music for chapel	19 05
402	Agricultural Department	Farm expense February	424 56
403	S. W. Shattuck	Students' pay roll February	211 51
404	" "	Petty expenses three months	54 79
405	Grace Peabody	Firing Machine shop	11 50
406	Samuel Roughton, Jr.	Regent's clerk	13 00
407	F. L. Will	Clerking and printing	35 62
408	Samuel Roughton	Firing Main Building, February, etc	48 00
409	T. J. Burrill	Petty expenses in department	5 75
410	S. W. Shattuck	Salary as Business Agent	50 00
411	T. J. Burrill	" " Cor. Sec'y	50 00
412	E. Snyder	" " Rec. "	50 00
413	G. E. Morrow	" " Farm Supt	50 00
	1882—February 28.		
414	Larrabee & North	Hardware	9 40
415	Fuller & Fuller	Glass	15 50
416	R. S. Wilber	Hauling	157 90
417	E. B. Benjamin	Chemical apparatus	54 78
418	F. W. Christern	Periodicals	125 63
419	John B. Mayo	Cleaning chronometer	5 00
420	W. H. Bullock	Microscope	224 90
421	W. T. Pratt	Painting and repairing	31 90
422	H. Swanell	Chemicals, etc	21 05
423	H. Swanell	Oil and paint	34 40
424	C. J. Sabin	Sewer pipe	9 60
425	Jno. S. Stott	Stationery	3 25
426	H. D. Chapin	Books	136 00
427	Electric Manufacturing Co	Electric bells, etc	33 43
428	Henry Horn	Coal	147 00
429	Walker & Mulliken	Waste baskets (3)	3 20
430	Peter Henderson	Seeds and plants	3 95
431	Trevett & Green	Hardware and labor	25 06
432	Crane Bros. Manufacturing Co	Valves and cocks	4 89
433	National Rubber Co	Gas bag	14 00
434	Crane Bros. Manufacturing Co	Pipe, flanges, etc	20 22
435	Crane Bros. Manufacturing Co	Pipe, hose, etc	77 46
436	Horticultural Department	Work on grounds	40 68
437	I. C. R. R. freight	Freight, 3 months	227 10
438	Trevett & Green	Hardware, etc	21 79
439	C. M. Woodward	Books	25 00
440	W. H. Bullock	Apparatus	10 00
441	L. W. Van Schaick Co	Lumber	298 32
442	Champaign Gas Co	Gas for January, 1881	63 00
443	Champaign Gazette	Printing, etc	8 55
444	Architectural Department	Work and material	1,048 86
445	Architectural Department	Work and material	215 87
446	Mrs. Abby Wilkinson	Organist, winter term	12 50
447	W. B. Carman	Choir leader winter term	12 50
448	Mechanical Department	Work and material	82 70
449	Mechanical Department	Work and material	200 94
450	Jno. S. Stott	Rubber rings	2 75
451	E. N. McAllister	Postage, 3 months	53 50
	March 15.		
452	S. M. Millard	Expenses to March meeting	20 58
453	A. McLean	" " "	28 90
454	Chas Bennett	" " "	4 68
455	R. N. Paden	" " "	12 50
456	Emory Cobb	" " "	48 45
457	Champaign Gas Co	Lights, February, 1882	84 90
458	R. S. Polk & Co	Advertising	25 00
459	Irvin Rea	Work on grounds	2 38
460	A. H. Roffe & Co	Periodicals	201 60
461	J. C. Pickard	Expenses in examining schools	2 50
462	Fuller & Fuller	Freights, etc., on Engineering inst	23 00

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
	March 31.		
463	S. H. Peabody	Salary, March, 1882	$250 00
464	T. J. Burrill	" "	150 00
465	S. W. Shattuck	" "	150 00
466	E. Snyder	" "	150 00
467	D. C. Taft	" "	150 00
468	J. C. Pickard	" "	150 00
469	N. C. Ricker	" "	150 00
470	J. D. Crawford	" "	150 00
471	H. A. Weber	" "	150 00
472	G. E. Morrow	" "	150 00
473	F. W. Prentice	" "	125 00
474	P. Roos	" "	100 00
475	I. O. Baker	" "	125 00
476	M. A. Scovell	" "	100 00
477	C. H. Peabody	" "	90 00
478	C. E. Pickard	" "	90 00
479	E. A. Kimball	" "	110 00
480	J. Sondericker	" "	60 00
481	N. S. Spencer	" "	50 00
482	C. W. Rolfe	" "	75 00
483	J. E. Armstrong	" "	40 00
484	C. C. Barnes	" "	40 00
485	A. B. Baker	" "	50 00
	April 15.		
486	Fuller & Fuller	Glass and tubing	24 17
487	Julius Welske	Mason work	1 50
488	Luddington, Wells & V. S. Co	Lumber	153 54
489	Bradner Smith	Roll of wrapping	7 15
490	"Illini"	Printing and advertising	24 16
491	Inter-Ocean	Advertising	10 00
492	J. E. Armstrong	Specimens for Museum	15 00
493	J. P. Stuart	Work and teaming	8 12
494	Fuller & Fuller	Glass	15 13
495	E. B. Benjamin	Apparatus	27 75
496	D. C. Taft	Express on minerals	3 50
497	Champaign and Urbana Gas Co	Gas light, March, 1882	90 00
498	Ganthiers & Villars	Books	7 07
499	Anton Iten	Work on rifle range	20 25
500	Carl Schvenhof	Books	44 11
501	P. F. Van Everen	Labels for Library	1 60
502	Agricultural Department	Farm expense, March, 1882	673 72
503	Douglass, Thompson & Co	Photographic apparatus	50 40
504	S. W. Shattuck	Students' pay roll	154 44
505	R. B. Harmel	Painting	12 25
506	G. W. Parker	Work in Architectural shops	49 50
507	Houghton. Mifflin & Co	Books	6 40
508	Samuel Roughton	Firing	49 50
509	Grace Peabody	Salary, March, 1882	16 25
510	Cyrus W. Butler	Cabinet specimen	4 00
511	Stearns & Co	One barrel stucco	2 40
512	J. F. Wollensak	Hardware	5 12
513	T. J. Burrill	Pay roll	51 35
514	Central Telephone Co	Instrument 2 quarters	18 00
515	Larrabee & North	Hardware	24 71
	April 29.		
516	S. H. Peabody	Salary, April, 1882	250 00
517	T. J. Burrill	" "	150 00
518	S. W. Shattuck	" "	150 00
519	E. Snyder	" "	150 00
520	D. C. Taft	" "	150 00
521	J. C. Pickard	" "	150 00
522	N. C. Ricker	" "	150 00
523	J. D. Crawford	" "	150 00
524	H. A. Weber	" "	150 00
525	G. E. Morrow	" "	150 00
526	F. W. Prentice	" "	125 00
527	P. Roos	" "	100 00
528	I. O. Baker	" "	125 00
529	M. A. Scovell	" "	100 00
530	C. H. Peabody	" "	90 00
531	C. E. Pickard	" "	90 00
532	E. A. Kimball	" "	110 00

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
533	J. Sondericker	Salary, April, 1882	$60 00
534	N. S. Spencer	" "	50 00
535	C. W. Rolfe	" "	75 00
536	J. E. Armstrong	" "	40 00
537	C. C. Barnes	" "	40 00
538	A. B. Baker	" "	50 00
539	Colegrove Book Co	Books	331 54
	May 15.		
540	Agricultural Department	Farm expense	768 85
541	Publishers "Illini"	Printing	4 00
542	B. M. Whittemore	Services	5 25
543	Besore Bros	Lime	1 50
544	Champaign and Urbana Gas Co	Lights for April, 1882	58 50
545	Henry Gorringe	Book	15 00
546	U. S. Patent Office	Binding reports	15 60
547	N. E. Publishing Co	Publications	1 50
548	Illinois State Journal	Subscription	4 85
549	G. A. Bert	Painting	25 24
550	Grace Peabody	Salary, April, 1882	14 75
551	G. W. Parker	Work in Architectural shops	26 66
552	Samuel Roughton	Salary fireman, April, 1882	45 00
553	E. Miller	Cambric	4 00
554	Carl Schvenhof	Books	8 80
555	Publisher Herald	Printing	3 75
556	H. Bronson	Brooms	3 50
557	Lyon & Healy	Music books	4 41
558	H. R. Buckles	Plumbing	10 45
559	Horticultural Department	Expense for March and April. 1882	184 43
560	S. W. Shattuck	Students' pay-roll, April, 1882	181 61
	May 31.		
561	S. H. Peabody	Salary, May, 1882	250 00
562	T. F. Burrill	" "	150 00
563	S. W. Shattuck	" "	150 00
564	E. Snyder	" "	150 00
565	D. C. Taft	" "	150 00
566	J. C. Pickard	" "	150 00
567	N. C. Ricker	" "	150 00
568	J. D. Crawford	" "	150 00
569	H. A. Weber	" "	150 00
570	G. C. Morrow	" "	150 00
571	F. W. Prentice	" "	125 00
572	P. Roos	" "	100 00
573	I. O. Baker	" "	125 00
574	M. A. Scovell	" "	100 00
575	C. H. Peabody	" "	90 00
576	C. E. Pickard	" "	90 00
577	E. A. Kimball	" "	110 00
578	J. Sondericker	" "	60 00
579	N. S. Spencer	" "	75 00
580	C. W. Rolfe	" "	40 00
581	J. E. Armstrong	" "	40 00
582	C. C. Barnes	" "	50 00
583	A. B. Baker	" "	50 00
584	T. J. Burrill	Three months' salary as Secretary	50 00
585	S. W. Shattuck	" " " Business agent	50 00
586	E. Snyder	" " " Secretary	50 00
587	G. E. Morrow	" " " Farm Sup't	50 00
588	Mrs. Abbie Wilkinson	" " " Organist	12 50
589	W. B. Carman	" " " Choir leader	12 50
590	Horticultural Department	Expenses for May	91 35
591	Agricultural Department	" " "	349 15
592	Troughton & Sims	Balance on instrument	16 48
593	S. H. Peabody	Sundry expenses	11 40
594	Illini	Printing, etc	24 16
595	E. Myers	Work on grounds	4 50
596	I., B. & W. Railway	Freight	5 12
597	Architectural Department	Power and material	60 00
598	Mechanical Department	" " "	60 00
599	Agricultural Department	Transfer of apparatus	148 59
600	Grace Peabody	Salary for May, 1882	16 00
601	I. O. Baker	Sundry expenses	2 75
602	J. C. Carman	Advertising	3 00
603	H. Swannell	Chemicals and paints	10 65
604	Champaign County Gazette	Printing and binding	14 02

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
	May 31, 1882—*Continued.*		
605	Trevett & Green	Hardware	$14 55
606	Charles Stodder	Apparatus	120 00
607	Henry Horn	Seven cars coal	126 00
608	Trevett & Green	Lawn mower, etc	27 55
609	Trevett & Green	Copper pails	4 25
610	A. P. Cunningham	Wax	2 75
611	J. Bacon	Three cars coal	23 28
612	James W. Queen & Co	Electric battery	35 75
613	J. W. Bunn	Taxes (wild lands)	2,150 00
614	E. S. Ritchie & Sons	Apparatus	153 99
615	Western Bank Note Engraving Co	Diplomas	37 25
616	Peterson & Lloyd	Stationery	7 45
617	E. N. McAlister	Postage	46 06
618	S. W. Shattuck	Students' pay roll	153 99
619	S. W. Shattuck	Petty expenses, March	33 86
	June 15.		
620	S. W. Millard	Expenses to meetings	39 06
621	Chas. Bennett	" " "	11 36
622	J. O. Cunningham	Attorneys' fees	50 00
623	Brooks Oil Co	Lard oil	30 61
624	Champaign County Gazette	Catalogues	292 50
625	Colegrove Book Co	Books	235 15
626	S. Roughton	Fireman's salary	55 50
627	J. Sondericker	Lettering diplomas	12 65
628	G. C. Willis	Ribbons	2 15
629	G. W. Parker	Work in Architectural shops	45 90
630	C. H. Evans	Advertising	2 00
631	Champaign Gas Co	Lights, May, 1882	41 40
632	Illini	1,500 Commencement programmes	10 00
633	Robson & Burr	Boiler tubes	2 00
634	E. G. Holton	Fence repair	1 05
635	D. C. Haven	Services as Marshal, Spring Term	5 25
	June 30.		
636	S. H. Peabody	Salary, June, 1882	250 00
637	T. J. Burrill	" "	150 00
638	S. W. Shattuck	" "	150 00
639	E. Snyder	" "	150 00
640	D. C. Taft	" "	150 00
641	J. C. Pickard	" "	150 00
642	N. C. Ricker	" "	150 00
643	J. D. Crawford	" "	150 00
444	G. E. Morrow	" "	150 00
645	H. A. Weber	" "	150 00
646	F. W. Prentice	" "	125 00
647	P. Roos	" "	100 00
648	I. O. Baker	" "	125 00
649	M. A. Scovell	" "	100 00
650	S. H. Peabody	" "	90 00
651	C. E. Pickard	" "	90 00
652	E. A. Kimball	" "	110 00
653	J. Sondericker	" "	60 00
654	N. S. Spencer	" "	50 00
655	C. W. Rolfe	" "	75 00
656	J. E. Armstrong	" "	40 00
657	C. C. Barnes	" "	40 00
658	A. B. Baker	" "	50 00
	July 1.		
659	A. J. Sharp	Work in armory	4 98
660	American J. C. Club	Books	15 00
661	M. E. Lapham	Lumber	94 58
662	M. E. Lapham	"	37 15
663	R. S. Wilber	Hauling	61 85
664	C. W. Craig	Gear cutting	1 75
665	B. F. Stevens	Books	99 48
666	Colegrove Book Co	"	42 59
667	Henry & Kariher	Lead and oil	29 48
668	N. S. Spencer	Work	20 75
669	Grace Peabody	Salary, June, 1882	11 50
670	Agricultural Department	Farm expense	834 50

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
	1882. July 15—*Continued.*		
671	George W. Parker	Work in Architectural shops	$32 04
672	E. Cobb	Expense to meetings	15 50
673	S. W. Shattuck	Students' pay-roll	193 33
674	Tice & Linch	Shipping charges	4 35
675	E. Myers	Painting	16 25
676	Horticultural Department	Expense for June, 1882	102 32
677	W. T. Pratt	Roof repair	9 61
678	Besore Bros	Lumber and cement	43 80
679	B. M. Price	Teaming	7 50
680	C. & U. Gaslight Co	Lights, June, 1882	15 00
681	Henry Siegmond	Mason work	11 02
682	Central Telephone Co	Quarter's rent	15 00
683	J. E. Armstrong	Work and expenses in Museum	6 00
684	Chicago Lead & Oil Co	White lead	24 18
685	C. F. Conover	Work in shops	52 00
686	A. Williams & Co	Books	3 50
687	Henry Horn	Two cars coal	36 00
688	J. T. Wilson	Blacksmithing	5 80
689	J. C. Welshley	Turning	8 00
690	W. T. Dowdall	Advertising	15 00
	July 31.		
691	S. H. Peabody	Salary, July, 1882	250 00
692	T. J. Burrill	" "	150 00
693	S. W. Shattuck	" "	150 00
694	E. Snyder	" "	150 00
695	D. C. Taft	" "	150 00
696	J. C. Pickard	" "	150 00
697	N. C. Ricker	" "	150 00
698	J. D. Crawford	" "	150 00
699	H. A. Weber	" "	150 00
700	G. E. Morrow	" "	150 00
701	F. W. Prentice	" "	125 00
702	P. Roos	" "	100 00
703	I. O. Baker	" "	125 00
704	M. A. Scovell	" "	100 00
705	E. A. Kimball	" "	110 00
706	A. B. Baker	" "	50 00
707	London Publishing Co	Books	36 00
708	F. A. Taft	Work in Laboratory	26 50
709	A. B. Baker	Making curtains	2 40
710	W. F. Lambdin	Mats	4 15
711	H. P. Little	Book	2 50
712	S. E. Cassino	"	2 70
713	Colegrove Book Co	Books	18 77
714	Johns Hopkins University	"	5 00
715	J. K. Le Baron	Advertising	5 00
716	F. W. Christern	Periodicals	9 67
717	A. Barr	Lumber	23 00
	August 15.		
718	Palmer, Fuller & Co	Newel posts	39 30
719	Larrabee & North	Tools and hardware	74 99
720	H. R. Buckles	Plumbing	3 80
721	Thomas Wright & Son	Castings	15 04
722	Charles Henne	Work on Observatory	4 25
723	D. Appleton & Co	Books	6 00
724	A. Barr	Walnut lumber	81 00
725	Agricultural Department	Farm expense, July	665 00
726	Horticultural Department	Department expense, July	7 75
727	Grace Peabody	Regent's clerk, July	4 62
728	S. W. Shattuck	Students' pay-roll	247 90
	August 31.		
729	S. H. Peabody	Salary, August, 1882	250 00
730	T. J. Burrill	" "	150 00
731	S. W. Shattuck	" "	150 00
732	E. Snyder	" "	150 00
733	D. C. Taft	" "	150 00
734	J. C. Pickard	" "	150 00
735	N. C. Ricker	" "	150 00
736	J. D. Crawford	" "	150 00
737	H. A. Weber	" "	150 00

List of Vouchers—Continued.

No.	To whom.	For what.	Amount.
	1882—August 31—*Continued.*		
738	G. E. Morrow	Salary, August, 1882	$150 00
739	F. W. Prentice	" "	125 00
740	P. Roos	" "	100 00
741	I. O. Baker	" "	125 00
742	M. A. Scovell	" "	100 00
743	E. A. Kimball	" "	110 00
744	A. B. Baker	" "	50 00
745	A. J. Stoneburner	Work	25 16
746	Rudolph Burkholz	Painting	8 75
747	N. S. Spencer	Salary, July, 1882	80 00
748	G. W. Parker	Work in Architectural Department	56 25
749	C. F. Conover	" " "	51 00
750	Pub. Western Business Guide	Advertising	20 00
751	James Maher	Work in Architectural Department	24 00
752	J. T. Wilson & Co	Blacksmithing	3 75
753	J. C. Lewis	Pitching	9 75
754	James Maher	Work	18 00
755	A. B. Baker	Pay-roll of women	213 75
756	W. G. Pratt	Roof repairs	13 00
757	Grace Peabody	Regent's clerk, August	5 25
758	A. J. Stoneburner	Salary, August	30 00
759	A. Barr	Brick	61 00
760	Wm. Frankenstein	Mason work	48 37
761	Hiller & Brightley	Engineering Instruments	45 42
762	Agricultural Department	Farm expense, August	935 42
763	C. F. Conover	Work in Architectural Department	54 00
764	G. W. Parker	" " "	69 47
765	James Maher	" " "	3 00
766	N. W. Davis	Sand	32 00
767	Rudolph Burkholz	Painting	47 25
768	J. C Lewis	Plastering	128 25
769	N. S. Spencer	Salary, August, 1882	80 00
770	T. J. Burrill	Salary Cor. Sec'y, 3 months	50 00
771	S. W. Shattuck	Salary Business Agent 3 months	50 00
772	E. Snyder	Salary Recording Secretary, 3 months	50 00
773	Horticultural Department	Work on grounds	137 30
774	J. P. Stewart	Work on grounds	2 00
775	S. W. Shattuck	Students' pay roll, August	182 32
776	E. Andrews	Tools	9 00
777	Henry Horn	Coal	300 00
778	Trevett & Green	Hardware, etc	37 80
779	Wm Price	Calsomining	256 75
780	Peterson & Lloyde	Stationery	6 05
781	M. A Barnes	Work	5 00
782	Eichberg Bros	Curtains, etc	28 51
783	Fuller & Fuller	Glass and oil	46 72
784	Elgin News Co	Advertising	8 00
785	Inter-Ocean	"	16 00
786	Prairie Farmer	"	14 00
787	H. Swannell	Oil and paint	13 46
788	Champaign Gazette	Printing and binding	52 40
789	N. A. Williams	Cement	20 65
790	Besore & Bros	Lime hair	85 45
791	E. Holenshade	Wire lathing	41 90
792	Crane Bros. Manufacturing Co	Pipe and fixtures	142 39
793	Crane Bros. Manufacturing Co	Pipe and fittings	28 12
794	Trevett & Green	Hardware	33 61
795	Henry & Kariher	Paint, oil, soap, etc	40 48
796	Western Rural	Advertising	7 68
797	Jno. S. Stott	Paper, envelopes, ink, etc	49 70
798	I. C. freight donation	Freight, 6 months	708 95
799	Architectural Department	Work for departments	151 07
800	Architectural Department	" account State Apps	1,064 46
801	Mechanical Department	" " " "	95 72
802	Mechanical Department	" account other departments	136 87
803	E. N. McAllister	Postage, 3 months	55 74
804	S. W. Shattuck	Petty expenses, 3 months	93 13

INDEX.

REPORT INDUSTRIAL UNIVERSITY.

INDEX.

A

B

H

I

J

L

M

N

O

P

R

S

T

U

V

W