CATALOGUE

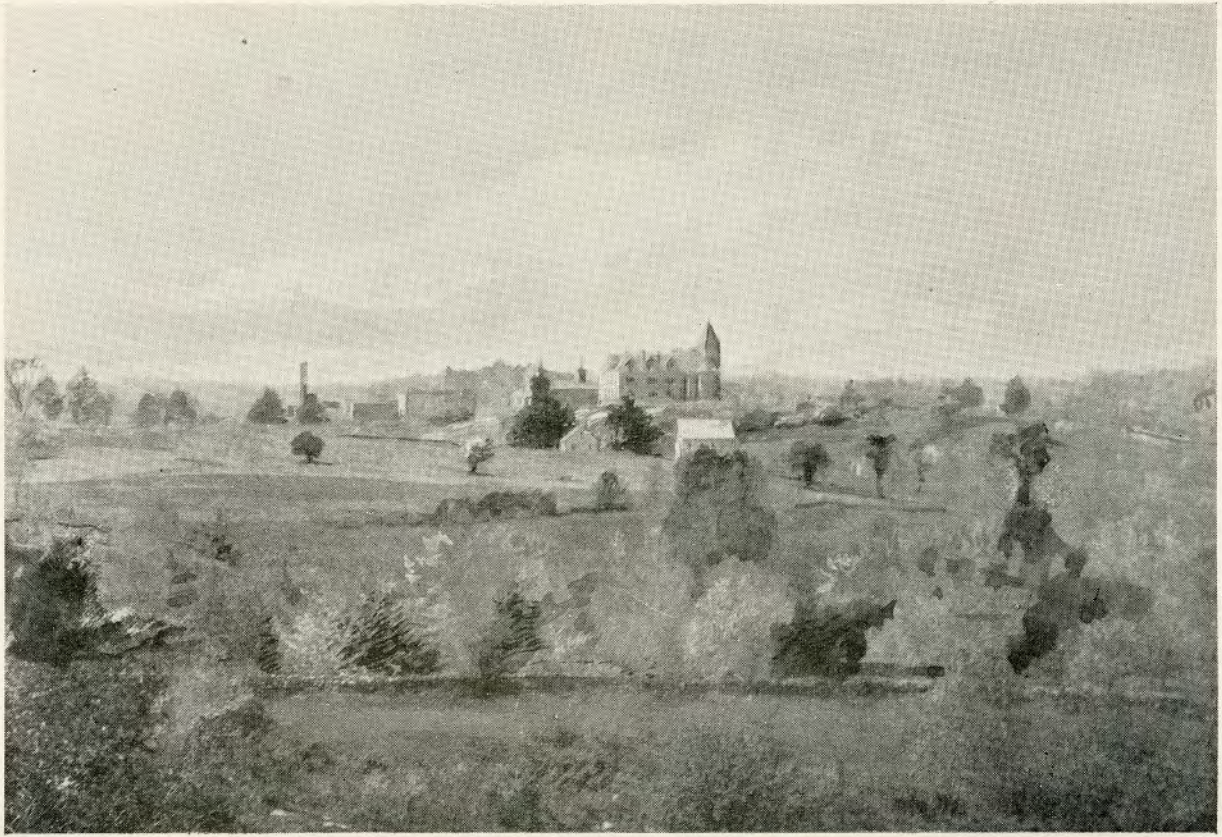
OF THE

New Hampshire College

OF

Agriculture and the Mechanic Arts.

1894-'95.



Bird's-eye View of New Hampshire College Buildings.

CATALOGUE

OF THE

NEW HAMPSHIRE COLLEGE

OF

AGRICULTURE

AND THE

MECHANIC ARTS

1894-1895

DURHAM
NEW HAMPSHIRE COLLEGE
1894

PRINTED BY
REPUBLICAN PRESS ASSOCIATION
CONCORD, N. H.
EDWARD N. PEARSON, PUBLIC PRINTER

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CATALOGUE

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OF THE

NEW HAMPSHIRE COLLEGE OF AGRICULTURE AND THE MECHANIC ARTS

1894–1895

At the session of the legislature of New Hampshire in 1866, an act was passed establishing the "New Hampshire College of Agriculture and the Mechanic Arts" on the basis of the congressional land grant, and authorizing its location in Hanover and connection with Dartmouth college.

In accordance with this act, the institution was organized under a board of trustees, appointed partly by the governor and council and partly by the corporation of Dartmouth college.

The act of congress, by virtue of which it was established, provides that its "leading objects 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 order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life."

An act of congress, approved August 30, 1890, provides an additional appropriation, which for the current year is twenty thousand dollars, and which is to be increased until it becomes twenty-five thousand dollars a year. This money is to be applied "to instruction in Agriculture, the Mechanic Arts, the English Language, and the various branches of Mathematical, Physical, Natural, and Economic Science, with special reference to their applications in the industries of life, and to the facilities for such instruction."

At the session of the legislature of New Hampshire in 1891, acts were passed severing the connection with Dartmouth college and removing the New Hampshire college from Hanover to Durham; accepting the Benjamin Thompson estate, which was then of the value of about four hundred thousand dollars, and, accumulating at four per cent. compound interest, will be available as an endowment in 1910; and providing one hundred thousand dollars to be used with certain other sums in the erection of buildings.

At the session of the legislature of New Hampshire in 1893, an act was passed appropriating thirty-five thousand dollars for completing and furnishing the buildings. These buildings have been finished, furnished, and supplied with apparatus. The New Hampshire college has completed the first year of work in its new location.

The college is carrying out the provisions of the acts of congress, by giving a practical and scientific education, which is of use in all the professions and industrial pursuits, by means of the following courses of study:

1. Courses in Agriculture:
   - A. Technical Course.
   - B. Chemical "
   - C. Biological "
   - D. Institute "
   - E. Non-resident "
2. Courses in the Mechanic Arts:
   - A. Mechanical Engineering Course.
   - B. Electrical Engineering "
   - C. Technical Chemistry "
3. General Course.

FACULTY

CHARLES S. MURKLAND, A. M., PH. D.. *President and Professor of English Language and Literature.*

CHARLES H. PETTEE, A. M., C. E., *Dean and Professor of Mathematics and Civil Engineering.*

CLARENCE W. SCOTT, A. M., *Professor of History and Political Economy.*

GEORGE H. WHITCHER, B. S., *Professor of Agriculture.*

ALBERT H. WOOD, B. S., *Associate Professor of Agriculture.*

FRED W. MORSE, B. S., *Professor of Organic Chemistry.*

CHARLES L. PARSONS, B. S., *Professor of General and Analytical Chemistry.*

CLARENCE M. WEED, D. SC., *Professor of Zoölogy and Entomology.*

ALBERT KINGSBURY, M. E., *Professor of Mechanical Engineering.*

HENRY C. HODGES, JR., FIRST LIEUTENANT, U. S. A., *Professor of Military Science.*

HERBERT H. LAMSON, M. D., *Instructor in Plant Diseases.*

GEORGE L. TEEPLE, M. E., *Instructor in Electrical Engineering and Physics.*

EDWIN B. DAVIS,* B. L., *Instructor in Modern Languages.*

JAMES HALL, *Instructor in Freehand Drawing.*

R. W. E. BASSETT, A. M., *Instructor in Modern Languages.*

CHARLES H. CLARK, A. M., *Instructor in Botany in the Summer School.*

JOHN N. BROWN, *Foreman of Machine Work.*

ALLEN G. LOWELL, *Foreman of Wood Work.*

EDWARD E. RUSSELL, *Engineer and Curator of Buildings.*

* Absent on leave.

STUDENTS

a—Agricultural Course; *c*—Course in Technical Chemistry; *m*—Mechanical Engineering Course; *g*—General Course.

SENIORS

Name.	Residence.	Room.
Adams, Frank Stanley *g*	*Gilsum.*	Nesmith Hall.
Britton, Frank Clifton *a* *	*Keene.*	Nesmith Hall.
Hill, Henry Elmer *g*	*Hanover.*	Thompson Hall.
Trow, Charles Arthur *m*	*Mt. Vernon.*	DeMeritt Hall.

JUNIORS

Kittredge, Lewis Harris *a*	*Keene.*	Hoitt House.
Wheeler, Delbert Amos *a*	*South Ashburnham, Mass.*	Prof. Scott's.
Hancock, Edward H. *m*	*Newton.*	Nesmith Hall.

SOPHOMORES

Barney, Harlan Winifred	*Grafton.*	Hoitt House.
Bartlett, Carrie Augusta *	*Lee.*	
Bartlett, Mary Blaisdell	*Epping.*	
Bartlett, David Burns	*Manchester.*	Prof. Scott's.
Berry, Walter Lincoln	*Lebanon.*	DeMeritt Hall.
Buck, Walter French	*Manchester.*	
Bunker, Mabel Eliza *	*Durham.*	Mr. J. J. Bunker's.
Chamberlin, Abby Florence	*Durham.*	Mr. Chamberlin's.
Chamberlin, George Hoitt *	*Durham.*	Mr. Chamberlin's.
Coe, John William	*South Newmarket.*	Mrs. Mathes's.
Colburn, Arthur Willard *	*Dracut, Mass.*	Nesmith Hall.
Comings, Carrie Lydia	*Durham.*	Mr. A. L. Comings's.
Comings, Mary Elizabeth	*Durham.*	Mr. A. L. Comings's.
Davis, Albert Herman *	*Durham.*	Mrs. A. L. Davis's.
Dennett, Irving Lyford	*Barnstead.*	Prof. Scott's.
Dockam, Charles Henry	*Newmarket.*	Newmarket.
Eastman, Eugene Bruce	*Portsmouth.*	Mr. C. Hoitt's.
Forristall, Elwin Henry	*Colebrook.*	Prof. Scott's.
Folsom, Emily Savage	*Dover.*	98 Silver St., Dover.
Foss, Fred Nathan	*Greenland.*	DeMeritt Hall.
Hayes, Leslie David	*Durham.*	Mr. Hayes's.

* Partial Course.

Name.	Residence.	Room.
Hunt, John Norton	*Peterborough.*	Mr. J. B. Nelson's.
Jenkins, Elery Dunbar	*Lee.*	Mr. J. E. Jenkins's.
Kenney, Lewis Hobart	*Pownal, Me.*	Prof. Wood's.
Mason, Woodruff	*Durham.*	Prof. Kingsbury's.
McKenna, George Thomas	*Exeter.*	Mr. Schoonmaker's.
Russell, William Fenno	*Lebanon.*	Mr. J. B. Nelson's.
Rand, Lewis Meader	*Newmarket.*	Newmarket.
Shaw, John Langdon Tallant	*North Chichester.*	Nesmith Hall.
Smith, Daniel Rundlett	*East Epping.*	Mr. C. Hoitt's.
Vickery, Charles William	*Dover.*	36 Summer St., Dover.
Whittemore, Everett Sydney	*Colebrook.*	Mr. J. B. Nelson's.
Wiggin, Tappan Sanborn	*Henniker.*	Creamery.
Young, Perley Arthur	*Newmarket.*	DeMeritt Hall.

FRESHMEN

Blodgett, Herbert Ralph	*Littleton.*	DeMeritt Hall.
Butterfield, Richard Cope	*Westmoreland.*	Mr. Chamberlin's.
Buzzell, Helen	*Lee.*	Lee.
Caverno, Bernice Elizabeth	*Lee.*	Lee.
Chamberlain, Henry Morse	*Marlboro, Mass.*	DeMeritt Hall.
Chase, Frank Rufus	*Epping.*	Thompson Hall.
Clarke, Frank Burnham	*Enfield.*	Creamery.
Coleman, James Albert	*Dover.*	Mr. Chamberlin's.
Corbett, Burton Albert	*Colebrook.*	Mr. J. B. Nelson's.
Chesley, Elizabeth Woodman	*Durham.*	Mr. J. S. Chesley's.
Chesley, Ivy May	*Durham.*	Mr. J. S. Chesley's.
DeMerritte, Frank	*Exeter.*	DeMeritt Hall.
Dudley, William Clark	*Marlboro, Mass.*	DeMeritt Hall.
Durgin, Alfred Caverly	*Lee.*	Lee.
Fielden, Henry Brown	*Newport.*	DeMeritt Hall.
Foord, James Alfred	*Walpole.*	Nesmith Hall.
Foss, Edna Ethel	*Durham.*	Mr. M. K. Foss's.
Fullerton, John William	*Somersworth.*	Somersworth.
Haley, John Myron	*Dover.*	123 Portland St., Dover.
Hayes, Mabel Lucy	*Durham.*	Mr. Hayes's.
Howe, Horace Leonard	*Hollis.*	DeMeritt Hall.
Ladd, Samuel Tilton	*Epping.*	Mr. Chamberlin's.
Maloney, James Patrick	*Franklin Falls.*	Mr. Schoonmaker's.
Mathes, Harry Clinton	*Durham.*	Mrs. Thompson's.

Name.	Residence.	Room.
Meader, Alice Maude	*Newmarket.*	Newmarket.
Meader, Albert Eli	*Rochester.*	Hoitt House.
Moore, Herbert Fisher	*Penacook.*	DeMeritt Hall.
Morgan, Gerry Austin	*Milford.*	Mr. Chamberlin's.
Osborn, Ernest Sumner	*Rochester.*	Hoitt House.
Philbrick, John	*Seabrook.*	Mr. Chamberlin's.
Rice, Herbert Wood	*Henniker.*	
Richardson, Harry Putnam	*Milford.*	Mr. Chamberlin's.
Roberts, John Harry	*Rollinsford.*	
Sanborn, Fred Dexter,	*Ashland.*	DeMeritt Hall.
Shaw, Elijah Ray	*Nashua.*	
Shaw, Roscoe Hart	*Milton.*	DeMeritt Hall.
Simpson, Etta Lillian	*Durham.*	Mr. Simpson's.
Smart, Fannie Faustina	*Dover.*	Dover.
Smith, Cyrus Everett	*Hanover.*	
Smith, Fred Webster	*Franklin Falls.*	Mr. Schoonmaker's.
Snell, Edna Bernice	*Lee.*	Lee.
Straw, Edson Albert	*Pittsfield.*	Nesmith Hall.
Stevens, David Albert	*Durham.*	
Taft, DeForest Reed	*Winchester.*	DeMeritt Hall.
Thompson, George Winslow	*Epping.*	Mr. Hill's.
Tolles, Benjamin D.	*Somersworth.*	Somersworth.
Warner, Arthur Edward	*Riverside, R. I.*	DeMeritt Hall.
Watson, Frank Edwin	*Rock Bottom, Mass.*	Mr. Buzzell's.
Wiggin, Nellie Foss	*Lee.*	Lee.
Young, Rena Etta	*Newmarket.*	Mr. Hill's.

SPECIAL STUDENTS

Name.	Residence.	Subject.
Smith, Melvin Monroe	*Dover.*	Biology.
Smith, Jennie S.	*Newmarket.*	Biology.

SUMMER SCHOOL OF BIOLOGY

Name.	Residence.
Andrews, B. S.	*Manchester, New Hampshire.*
Coleman, Lydia Smith	*Newington, New Hampshire.*
Coleman, Dorothy	*Newington, New Hampshire.*
Folsom, Mabel A.	*West Epping, New Hampshire.*
Hacker, Emma L.	*Westbrook, Maine.*
Howe, Frederic W.	*Hollis, New Hampshire.*

Name.	Residence.
Kennedy, Nellie A.	*East Jefferson, Maine.*
Norton, William K.	*Milton, New Hampshire.*
Pease, Abbie A.	*South Newmarket, New Hampshire.*
Sanborn, Marion	*Kingston, New Hampshire.*
Sanborn, Grace	*Kingston, New Hampshire.*
Serex, Frederic	*Boston, Massachusetts.*
Thompson, Charlotte A.	*Durham, New Hampshire.*
Upton, Clara E.	*Nashua, New Hampshire.*
Young, Roxana P.	*Dover, New Hampshire.*

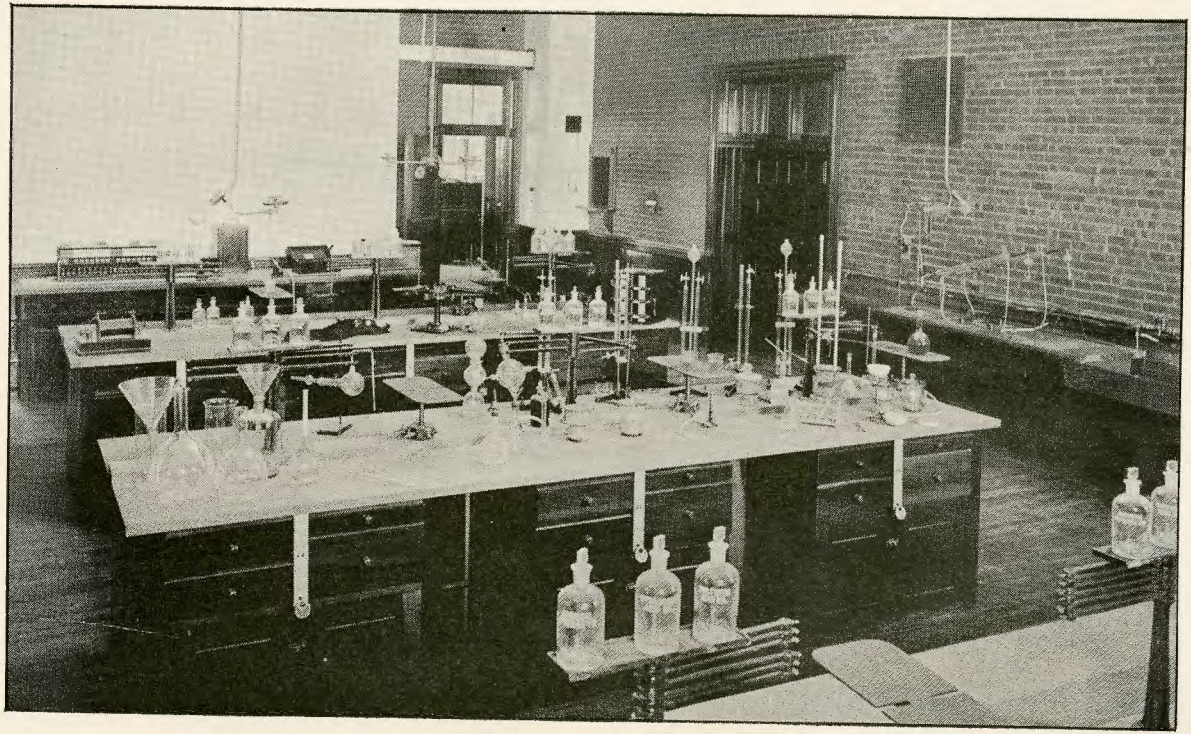
NON-RESIDENT COURSE IN AGRICULTURE

Abbott, S. E.	*East Aurora, New York.*
Adams, Charles L.	*East Providence, Rhode Island.*
Anderson, James A.	*Andover, Illinois.*
Ballinger, Ellis G.	*East View, Virginia.*
Bennett, Fred R.	*Bridgehampton, New York.*
Bates, H. E.	*Painesville, Ohio.*
Cable, D. J.	*Lima, Ohio.*
Calhoun, W. H., Jr.	*Jefferson, North Carolina.*
Chiashi, Lute Y.	*Carpenteria, California.*
Colby, Frank N.	*North Londonderry, New Hampshire.*
Coleman, Mrs. C. H.	*Newington, New Hampshire.*
Coleman, Lydia	*Newington, New Hampshire.*
Cowie, Allan	*Arcadia, Wisconsin.*
Crane, John J.	*New York, New York.*
Crosby, D. L.	*Peterborough, New Hampshire.*
Davis, B. F.	*South Lee, New Hampshire.*
Dodge, Edwin H.	*New Boston, New Hampshire.*
Dodge, William O.	*New Boston, New Hampshire.*
Dunham, G. Burton	*Boston, Massachusetts.*
Fernald, William L.	*Eliot, Maine.*
Gardner, James P., Jr.	*Brooklyn, New York.*
Guthrie, Samuel	*St. Louis, Missouri.*
Hammar, J. F.	*Swampscott, Massachusetts.*
Heimdal, Charles J.	*Prairie Farm, Wisconsin.*
Herrwig, Geo. W.	*Mason City, Illinois.*
Hill, D. H.	*South Lee, New Hampshire.*
Hoyt, Florence	*Newington, New Hampshire.*
Jamieson, William	*St. Louis, Missouri.*

Name.	Residence.
Killough, Harry	*Richmond, Kansas.*
Laskowski, Edward H.	*Brooklyn, New York.*
Lucas, A. G.	*Des Moines, Iowa.*
Lyon, C. D.	*Higginsport, Ohio.*
Morse, Elisha W.	*New Boston, New Hampshire.*
Pickering, Amanda	*Newington, New Hampshire.*
Pickering, Eldora A.	*Newington, New Hampshire.*
Ray, A. D.	*Brooklyn, Georgia.*
Reibsamen, F.	*Cabin Point, Virginia.*
Rengermann, William	*East Granby, Connecticut.*
Robb, George	*Tonganoxie, Kansas.*
Robbins, Luther	*Hollis Depot, New Hampshire.*
Roe, R. E.	*Storm Lake, Iowa.*
Sanford, George F.	*Winchester, New Hampshire.*
Sanford, S.	*Portsmouth, Rhode Island.*
Sawyer, Ansel B.	*Gilford, New Hampshire.*
Sleeper, Katherine	*Wonolancet, New Hampshire.*
Smith, George Wm.	*St. James, New York.*
Snodgrass, James	*St. Louis, Missouri.*
Staples, Faith E.	*Newington, New Hampshire.*
Staples, Mrs. F. M.	*Newington, New Hampshire.*
Stoneroad, V.	*Lewistown, Pennsylvania.*
Sumpter, O. H.	*Hot Springs, Arkansas.*
Teague, F. W.	*Victoria, British Columbia.*
Upham, Walter J.	*Weston, Massachusetts.*
Walden, A. T.	*Wonolancet, New Hampshire.*
Whaley, E. M.	*Courtenay, Florida.*
Whitehead, A. C.	*Eastman, Georgia.*
Williamson, Syvert S.	*Addison, Iowa.*

SUMMARY

Freshmen	50
Sophomores	34
Juniors	3
Seniors	4
Specials	2
Summer School Students	15
Non-Resident Students	57
	165
Twice Classified	1
	164



Quantitative Chemical Laboratory.

ADMISSION

Candidates for the first year must present testimonials of good moral character, and must pass an examination in the following subjects:

a. Arithmetic, including the metric system.
b. Algebra, to quadratics.
c. Plane Geometry.
d. Political and Physical Geography.
e. Physiology.
f. American History.
g. English.

Those who pass also an examination in Myer's and Allen's Ancient History and Myer's Mediæval and Modern History, or its equivalent, may take French in place of the History of the first year.

In English the examination will consist in the criticism of specimens of incorrect English, together with a short essay, correct in spelling, punctuation, division into paragraphs, grammar and expression, on a subject to be announced at the time of the examination. In 1895 the subject will be taken from one of the following books; Shakespeare's Merchant of Venice and Twelfth Night; Milton's L'Allegro, Il Penseroso, Comus and Lycidas; Longfellow's Evangeline; the Sir Roger de Coverly Papers in the Spectator; Macaulay's Essay on Milton and Essay on Addison; Webster's first Bunker Hill Oration; Irving's Sketch-Book; Scott's Abbot.

In 1896, Shakespeare's Merchant of Venice and Midsummer Night's Dream; Milton's L'Allegro, Il Penseroso, Comus and Lycidas; Longfellow's Evangeline; Macaulay's Essay on Milton; Webster's first Bunker Hill Oration; De Foe's History of the Plague in London; Irving's Tales of a Traveler; Scott's Woodstock; George Eliot's Silas Marner.

In 1897, Shakespeare's Merchant of Venice and As You Like It; Scott's Marmion; Longfellow's Evangeline; Burke's Speech on Conciliation with America; Macaulay's Life of Samuel Johnson; De Foe's History of the Plague in London; Irving's Tales of a Traveler; Hawthorne's Twice-Told Tales; George Eliot's Silas Marner.

Students are advised to prepare themselves thoroughly in all the required subjects, and especially in English, in order that they may be able to express themselves clearly, concisely, and accurately.

They are further recommended not to limit their preparation to these requirements. The excellent academies and high schools of New Hampshire put within their reach a preliminary training which will add greatly to the value of a college course.

Candidates for advanced standing are examined in the studies that have been pursued by the class which they propose to enter, as well as in the studies required for admission.

A certificate from any academy or high school will be accepted in place of an examination, upon any subject required for admission to the first year. Every certificate must state the amount of work done by the student, his proficiency, and the text-books used; and in case it is not evident that the student is thoroughly prepared, an examination will be required. Certificate forms will be furnished on application.

The times for examination are Monday and Tuesday, June 3 and 4, and Tuesday and Wednesday September 3 and 4, 1895. Candidates must present themselves with their credentials on the first day of the examination, as indicated by the Calendar.

Upon the request of the principal of any high school or academy, entrance examination papers will be sent to him June 1. If the principal receiving such papers holds an examination on Tuesday, June 4, and within one week sends the answers to the questions to the president, the examination will have the same effect as if held at the college.

DESCRIPTION OF STUDIES

For the Courses of Study see pages 56 et seq.

AGRICULTURE

1. How Crops Grow. *Forty-five exercises.*

This course consists of lectures and recitations upon the composition of plants, the composition and sources of their food, and the processes by which they obtain and assimilate the elements necessary for their growth.

2. Animal Nutrition. *Thirty exercises.*

This course consists of lectures and recitations upon the physiology of the alimentary organs, the composition of foods, their assimilation, and the composition of the animal body.

3. Principles of Agriculture. *Twenty exercises.*

An exposition of the relations of the natural sciences to agriculture.

4 and 5. Practical Agriculture. *One hundred exercises.*

These two courses form a consecutive series of exercises, in which instruction is given by means of practical talks and exercises relative to fertilizers, soils, fruits, vegetables, bees, fowls, and other subjects.

6. Dairying and Dairy Chemistry. *Forty-five exercises.*

Course 6 consists of lectures and recitations upon the composition and manufacture of dairy products, and practical work in the dairy room.

7. Practical Stock Feeding. *Thirty exercises.*

Course 7 is a continuation of Course 3, and consists of lectures upon the compounding of food rations for stock, the action of various foods upon the animal system, and the most approved practice in feeding for the production of milk, butter, live weight, etc. The lectures are accompanied by practical illustrations.

8. Applied Agriculture. *Twenty exercises.*

Course 8 is a continuation of Course 4, and is a further discussion of the relations and applications of the sciences to Agriculture.

9. Agricultural Engineering. *Twenty exercises.*

Course 9 consists of instruction in planning and locating drains, roads, and buildings, upon the farm; and discussions on the different forms and uses of agricultural machinery.

10. Stock Breeding. *Twenty exercises.*

Recitations and lectures.

11. Experimental Agriculture. *Twenty exercises.*

Course 11 is the conclusion of Courses 4 and 9, and consists of lectures upon the methods of agricultural research, discussions of problems under investigation by scientists, and observations of experiments in progress upon the College Farm.

12. Discussions of the Bulletins of Experiment Stations. *Thirty-five exercises.*

Course 12 consists of weekly discussions and reviews of bulletins, with reference to their scientific and practical value.

13. Special Work in Agriculture. *Thirty exercises.*

The time given to Course 13 will be used by the student in pursuing original work upon some subject in which he has shown especial ability, and may be chosen by him, subject to the approval of the Professor of Agriculture.

BOTANY

1. Introductory Botany. *Fifty exercises.*

A general introduction to the study of plants by means of laboratory work and lectures.

2. Structural Botany. *Forty-five exercises.*

Lectures and laboratory work on the minute structure and physiology of plants, with special reference to the lower forms.

Open only to those who have taken Course 1.

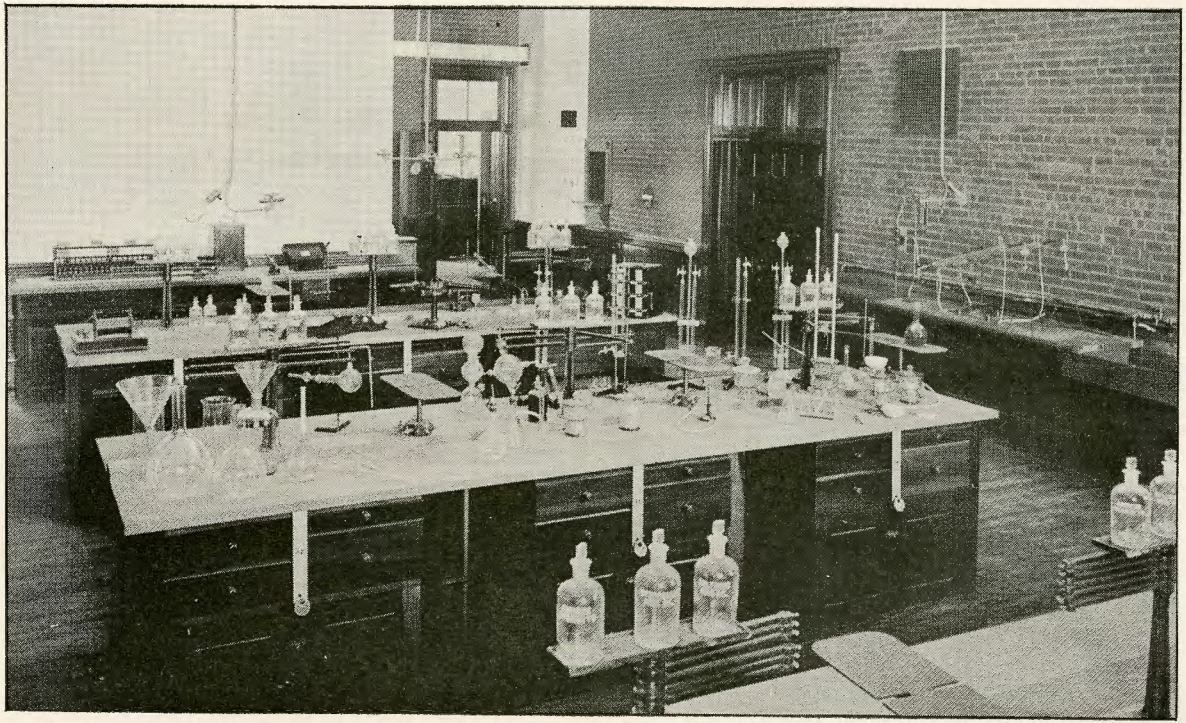
3. Forestry.

Lectures concerning the utility of forests, principles of sylviculture; forestry laws, character and composition of woods, and the distribution of timber trees in the United States.

4. Plant Diseases. *Thirty exercises.*

A study by means of lectures and laboratory work of some of the more important fungous diseases of cultivated plants and the means of preventing their injuries.

Open only to students who have completed Botany 1 and 2.



Quantitative Chemical Laboratory.

5. Advanced Botany.

Avreaging four exercises a week for a year.

Course 5 is intended for students electing botany for their Senior year, the instruction to be modified by needs of individual students.

Open only to those who have taken all preceding courses.

CHEMISTRY

1. Inorganic Chemistry. *Forty-five exercises.*

Lectures and recitations on general theoretical chemistry, illustrated by experiments, charts, specimens, lantern views, etc. Solutions of chemical problems will be required.

2. Inorganic Chemistry. *Thirty exercises.*

Course 2 is a continuation of Course 1, but the time will be spent mainly on the metallic elements, their metallurgy, salts, etc.

Open only to students who have passed in Course 1.

3. Organic Chemistry. *Thirty exercises.*

Course 3 will consist of lectures and recitations on the chemistry of the carbon compounds, together with the study of their properties by means of laboratory practice.

Open only to students who have passed in Course 1.

4. Organic Chemistry. *Twenty exercises.*

Course 4 is a continuation of Course 3 and must be preceded by it.

5. Qualitative Chemical Analysis.

Course 5 consists of laboratory practice with occasional lectures. The student is expected to become proficient in the separation and detection of the common acids and bases, and to keep a full set of notes. He will have practice in the writing of reactions and will fill out numerous slips containing questions bearing upon his work.

Open only to students who have completed Courses 1 and 2.

6. Qualitative Analysis completed and Quantitative Analysis begun. *Course extends through two terms.*

The work in quantitative analysis will be, in the main, elementary and pre paratory for advanced work.

Open to those who have completed Course 5.

7. Applied or Industrial Chemistry. *Forty exercises.*

Course 7 consists of lectures on chemical manufactures, such as iron, steel sugar, salt, sodium carbonate, fertilizers, sulphuric acid, glass, matches, paints

dyes, soaps, illuminating gas, petroleum, etc. The lectures will be illustrated by lantern views; and trips to the leading New England cities, to examine important chemical manufactures, will be taken as far as practicable.

Open only to those who have completed Courses 1, 2, 3, and 4.

8. Quantitative Analysis.

Course 8 consists of special work arranged for those in the Agricultural Course who are limited to the chemistry of the Junior Year. The course consists mainly in the analysis of fertilizers, fodders, grains, milk, and other dairy products, etc.

Open to those students who have completed Course 5.

9. Advanced Quantitative Analysis.

Course 9 extends through the year and is intended to fit the student for work in the laboratories of agricultural experiment stations, fertilizer works, iron works, sugar refineries, etc.; and for the duties of the public analyst. The course will be made to fit the end which each has in view, and will be largely an individual one. For those students in the Chemical Division of the Agricultural Course the analyses made will tend in the main toward agricultural products, fertilizers, mucks, marls, manures, dairy products, waters, food stuffs, sugars, etc. For the student wishing to enter metallurgical works the analyses will be in the main upon iron, steel, and other metals, ores, limestone, slags, alloys, fuels, etc. As a preparation to the study of medicine, work will be done on poisons, foods, drugs, urine, etc. Other lines will be arranged to meet the wants of the individual student. Every student will be given some practice in all of the branches of agricultural, metallurgical, medical, sanitary, and industrial chemistry, in order to lay a foundation for any future work which may be required of them. A short course in gas analysis will also be provided. A portion of the time of the last two terms is given to work bearing upon the preparation of a graduating thesis.

Open to students who have completed Course 6.

10. Organic Chemistry.

Course 10, for students in the Chemical Division of the Agricultural Course, and in the Technical Chemistry Course, consists of laboratory practice by the students in preparing and purifying products relating to their respective lines of work.

Open to those who have taken Courses 3 and 4.

11. Chemical Journals, Methods, etc. *Thirty-five exercises.*

The work consists in the study of current chemical literature, which is mainly in the German language, with recitations once a week throughout the year. Each student will be expected to prepare abstracts, reports, criticisms, etc., upon assigned articles.

Open to students taking Course 9.

12. Chemical Philosophy. Lectures and Recitations.
Forty exercises.

Work consists in advanced study of chemical theory. Practical experiments will be performed, with the aid of the student, in the determination of vapor density, molecular weights, specific heat, etc.; and the study of isomorphism, diffusion of gases, solutions, molecular and atomic volume, etc., will take up much of the time.

Course 12 comes in alternate years with Course 7 and is open to students who have completed Courses 1, 2, 3, and 4.

DRAWING

Two and one half hours work is reckoned as one exercise.

1. Freehand Drawing.

a. Thirty exercises. *b. Twenty exercises.*

The course includes outline drawing from models, and groups of common objects, light and shade drawing from models and from casts of historic ornament; the consideration of perspective principles; elementary design; machine sketching and the use of instruments.

2. Advanced Freehand Drawing.

a. Thirty exercises. *b. Twenty exercises.*

This course includes drawing from the cast and from still life with charcoal and stump; pencil sketching; the use of water color; design.

3. Descriptive Geometry and Drawing.

a. Fifty exercises. *b. Thirty exercises.*

Graphic solution of problems in solid geometry.

Course 2 is open only to those who have taken Mathematics 2.

4. Mechanical Drawing.

a. Elementary Projection Drawing. *Twenty exercises.*

b. Perspective Drawing and Line Shading. *Twenty exercises.*

c. Workshop Drawings. Tracing and the blue process of copying drawings. *Thirty exercises.*

ENGINEERING

1. Surveying. *Fifty exercises.*

Recitations, field work, and plotting, including compass, transit, plane-table, and level work.

2. Mechanism. *Seventy-five exercises.*

Recitations, and exercises in drawing outlines of elementary combinations.

Course 2 is open only to those who have taken Drawing 3.

3. Mechanics of Engineering. *One hundred exercises.*

a. Dynamics (Statics and Kinetics).

b. Mechanics of Materials.

Course 3 is open only to those who have taken Course 2 and Mathematics 6.

4. Materials of Construction. *Sixty exercises.*

Recitations on the production, properties, uses and preservation of engineering materials.

Course 4 is open only to those who have taken Course 3 b and Chemistry 2.

5. Thermodynamics. *Seventy-five exercises.*

Course 5 is open only to those who have taken Course 3 b and Physics 4 to 6.

6. Heat Motors and Refrigerating Machinery. *Thirty exercises.*

Recitations.

Course 6 is open only to those who have taken Course 5.

7. Construction and Theory of Dynamos and Electro-motors. *Seventy-five exercises.*

Lectures and quizzes.

Course 7 is open only to those who have taken Physics 4 to 6 and Mathematics 5 and 6.

8. Work in Mechanical Laboratory.

a. and *b*. Tests of Materials. *Sixty exercises.*

c. Tests of Boilers and Engines. *Twenty exercises.*

Courses 8 a and 8 b are open only to those who have taken Course 3 b. Course 8 c is open only to those who have taken Course 5.

9. Machine Design. *Forty exercises.*

Recitations.

Course 9 is open only to those who have taken Courses 3 and 4.

10. Dynamo Design. *Forty exercises.*

Work in the drawing room in the elementary designing of dynamos and electro-motors.

Course 10 is open to those who have taken Course 7.

11. Electrical Installations. *Thirty exercises.*

Lectures and quizzes on the methods and systems of electric lighting and electric distribution of power.

Course 11 is open only to those who have taken Course 7.

12. Sanitary Engineering. *Ten exercises.*

Lectures on heating, ventilation, drainage, and plumbing of public and private buildings.

13. Roads, Streets, and Pavements. *Twenty exercises.*

Recitations and lectures on construction and maintenance of paved, macadamized, and gravel roads, with discussion of laws relating thereto.

ENGLISH

1. Rhetoric. *Seventy exercises.*

Themes, with other exercises.

2. Three Themes. *One each term.*

3. Three Original Declamations. *One each term.*

4. Three Original Declamations. *One each term.*

5. English Literature, Chaucer to Addison. *Forty-five exercises.*

Study of authors.

6. English Literature, De Foe to Wordsworth. *Twenty exercises.*

Study of authors.

7. English Literature, Victorian Writers. *Thirty exercises.*

8. American Literature. *Forty exercises.*

Lectures and study of authors.

FRENCH

1. French Grammar and Tales. *Forty-five exercises.*

2. Easy Reading with Supplementary Syntax. *Thirty exercises.*

3. The Romantic School. *Thirty exercises.*

4. History of French Literature. *Forty-five exercises.*

5. Satire, Voltaire. *Thirty exercises.*

6. The Classic School. *Thirty exercises.*

Courses 4, 5, and 6 are open only to students who have completed the preceding courses.

GEOLOGY

1. Elementary Geology. *Thirty exercises.*

2. Mineralogy. *Thirty exercises.*

A short course in blowpipe analysis, followed by laboratory practice in the determination and study of minerals, with special reference to their economic value.

Course 2 is open only to students who have taken Chemistry 1 and 2.

3. Meteorology. *Twenty exercises.*

Recitations and lectures on wind systems, precipitation, humidity, laws of storms and tornadoes, and methods of prediction of atmospheric changes.

GERMAN

1. German Grammar and Tales. *Forty-five exercises.*

2. Easy Reading and Syntax. *Thirty exercises.*

3. Lyric Poetry. *Thirty exercises.*

4. Scientific German. *Forty-five exercises.*

5. Prose Literature. *Thirty exercises.*

6. German Drama. *Thirty exercises.*

Courses 4, 5, and 6 are open only to students who have completed the preceding courses.

HISTORY

1. Ancient History. *Forty-five exercises.*

2. Mediæval History. *Thirty exercises.*

3. Modern History. *Thirty exercises.*

4. American Political History. *Forty-five exercises.*

MATHEMATICS

1. Higher Algebra. *Sixty-five exercises.*

2. Solid Geometry, with advanced course. *Fifty-five exercises.*

3. Plane and Spherical Trigonometry. *Sixty exercises.*

4. Theory of Equations. *Thirty exercises.*

5. Analytic Geometry. *Seventy-five exercises.*

6. Differential and Integral Calculus. *One hundred exercises.*

PHILOSOPHY

1. Logic. *Thirty exercises.*

Lectures and recitations.

2. Ethics. *Twenty exercises.*

Lectures and recitations.

PHYSICS

1. Mechanics and Heat. *Forty-five exercises.*

2. Electricity and Magnetism. *Thirty exercises.*

3. Light and Sound. *Thirty exercises.*

Courses 1, 2, and 3 are a general introduction to the subject. The instruction is given by recitations and lectures, the latter being illustrated by experiments and stereopticon. Notes on lectures and experiments are submitted by each student.

4. Laboratory Work in Mechanics and Heat. *Forty-five exercises.*

5. Laboratory Work in Heat and Light. *Thirty exercises.*

6. Laboratory Work in Electricity and Magnetism. *Thirty exercises.*

The work consists in the experimental verification of the laws of physics and the determination of physical constants; for example, the student will by experiments investigate the intensity of gravity, co-efficients of friction, the analytical balance, elasticity of wires, specific heats, laws of radiation and absorption of heat, candle power of lights, dip, declination and intensity of the earth's magnetism, laws of electric currents, of electro-magnets, etc. A systematic and carefully written report on each experiment is required.

Courses 4, 5 and 6 are taken consecutively and are open only to those who have passed in Courses 1, 2 and 3. Students in Engineering must also have passed in Mathematics 1 to 6.

7. Electrical and Photometrical Measurements.

Thirty exercises.

The work consists in the measurement by various methods of current, resistances, and E. M. F., and in photometric study of arc and incandescent lamps.

Course 7 is open only to those who have passed in Courses 4, 5 and 6.

8. Experimental work on the efficiency, characteristic curves, and curves of potential of dynamos and motors.

Twenty exercises.

Course 8 is open only to those who have passed in Physics 7 and Engineering 7.

9. Advanced Work in Physical Laboratory.

One hundred and five exercises.

Course 9 is open only to those who have passed in Courses 1 to 6.

10. Astronomy. *Forty exercises.*

POLITICAL SCIENCE

1. Political Economy. *Lectures.* *Fifty exercises.*

2. Laws of Business. *Lectures.* *Thirty-three exercises.*

3. Constitutional Law. *Forty exercises.*

4. Advanced Political Economy. *Thirty exercises.*

Course 4 is open only to those who have taken Course 1.

SHOP WORK

Three hours work in the shops is reckoned as one exercise.

1. Work in Wood Shop.

Exercises in carpentry, joinery, and pattern making.

a. *Forty-five exercises.* *b.* *Thirty exercises.*
c. *Thirty exercises.* *d.* *Forty-five exercises.*
e. *Thirty exercises.* *f.* *Thirty exercises.*

2. Work in Machine Shop.

Exercises in bench work, machine work, and shop measurements.

a. *Thirty exercises.* *b.* *Twenty exercises.*
c. *Twenty exercises.* *d.* *Forty-five exercises.*
e. *Thirty exercises.* *f.* *Thirty exercises.*

ZOÖLOGY

1. Introductory Zoölogy. *Forty-five exercises.*

A general introduction to the study of animal life, by means of lectures and laboratory dissections of the principal types.

2. Animal Biology. *Forty exercises.*

A general study of the nature and process of animal life, with especial attention to heredity, variation, development, and mental powers.

Open to students who have taken Course 1.

3. Entomology. *Fifty exercises.*

A review of the classification, structural characters, and biological relations of insects, with a special study of those injurious to cultivated crops and domestic animals, and of the means of preventing their injuries.

Open only to those who have taken Courses 1 and 2.

4 *a*. Systematic Ornithology. *Twenty exercises.*

Lectures on the classification of birds, with laboratory determinations of species.

4 *b*. Economic Ornithology. *Twenty exercises.*

Lectures on the relations of birds to agriculture, and their relations to each other and to other organisms.

Courses 4 a and 4 b are open only to students who have taken Courses 1, 2, and 3.

5. Advanced Zoölogy.
Averaging four exercises a week for a year.

Course 6 is intended for those students who elect Zoölogy for their Senior Year. It will usually be modified to suit individual needs. Open only to those who have completed all preceding courses.

6. Zoölogical Bibliography. *One hour a week for a year.*

Open only to students taking Course 5.

7. Biological Literature. *Thirty exercises.*

COURSES OF STUDY

For details see Description of Studies.

REGULAR COURSE*

FRESHMAN YEAR.

FIRST TERM.

	Hours per week.
Rhetoric and Themes—English 1	2
Algebra and Geometry—Mathematics 1 and 2	6
Shop Work‡—Shop Work 1 *a*	3
Freehand Drawing—Drawing 1 *a*	2
Ancient History—History 1; or French†—French 1	3

SECOND TERM.

Rhetoric and Themes—English 1	2
Geometry and Trigonometry—Mathematics 2 and 3	6
Shop Work‡—Shop Work—1 *b*	3
Freehand Drawing—Drawing 1 *b*	2
Mediæval History—History 2; or French†—French 2	3

THIRD TERM.

Rhetoric and Themes—English 1	2
Trigonometry—Mathematics 3	3
Descriptive Geometry—Drawing 3 *a*; or Botany—Botany 1	5
Modern History—History 3; or French†—French 3	3
Theory of Equations—Mathematics 4; or Shop Work 1 *c*‡	3

*For the first two years students are not designated as being in any of the special courses, but all take the studies laid down in the regular course.

† French can be elected by those who have taken History 1, 2, and 3.

‡ French is taken by women in place of Shop Work.

Sophomore Year.

FIRST TERM.

	Hours per week.
Analytic Geometry—Mathematics 5; or Drawing 2 *a* and English Literature—English 5	5 or 4
French,‡ 1 or 4; or German 1; or Shop Work 1 *d*	3
Physics—Physics 1	3
Shop Work 1 *d*; or Botany 2	3
Descriptive Geometry—Drawing 3 *b*; or Inorganic Chemistry—Chemistry 1	2 or 3
One Theme.	

SECOND TERM.

Calculus—Mathematics 6; or Inorganic and Organic Chemistry—Chemistry 2 and 3	5 or 6
French 2 or 5; or German 2; or Shop Work 1 *e*	3
Physics—Physics 2	3
Drawing 3 *b*; or English Literature—English 6	2
Shop Work 1 *e*; or Drawing 1 *d*	3 or 2
One Theme.	

THIRD TERM.

Calculus—Mathematics 6; or Organic Chemistry—Chemistry 4; and Mineralogy—Geology 2	5
Surveying—Engineering 1	5
Physics—Physics 3	3
French 3 or 6; or German 3	3
One Theme.	

Women may substitute for surveying one of the elective studies from the third term of the Junior Year.

‡ French is required of those students who intend to take the work of the Chemical and Biological Divisions.

COURSE IN AGRICULTURE

This course is designed to give young men a thorough knowledge of practical Agriculture and the sciences having a direct bearing upon it, without neglecting the broad principles of a general education.

The strictly agricultural work is planned to give valuable knowledge for future use on the farm or in the dairy.

The Chemical and Biological Divisions are designed to give professional training in these two sciences which have such a close connection with modern Agriculture.

JUNIOR YEAR.

FIRST TERM.

	Hours per week
Zoölogy—Zoölogy 1	3
How Crops Grow—Agriculture 1	3
Chemistry—Chemistry 5	5
Plant Diseases—Botany 4	2
German—German 1; or Physical Laboratory—Physics 4	3
One Original Declamation—English 3.	

SECOND TERM.

Animal Nutrition—Agriculture 2	3
Geology and Meteorology—Geology 1 and 3	5
Agricultural Chemistry—Chemistry 8	3
Principles of Agriculture—Agriculture 3	2
German—German 2; Animal Biology—Zoölogy 2	3
One Original Declamation—English 3.	

THIRD TERM.

Entomology—Zoölogy 3	5
Ethics—Philosophy 2	2
Practical Agriculture—Agriculture 4	4
Roads—Engineering 13	2
German—German 3; or Chemistry—Chemistry 6	3
One Original Declamation—English 3.	

Senior Year.

FIRST TERM.

	Hours per week.
Laws of Business and Constitutional Law—Political Science 2 and 3	5
Dairying and Dairy Chemistry—Agriculture 6	3
Practical Agriculture—Agriculture 5	4
Discussion of Experiment Station Bulletins—Agriculture 12	1
German—German 4; or Political History—History 4	3
One Original Declamation—English 4.	

SECOND TERM.

Astronomy and Sanitary Science—Physics 10, Engineering 12	5
Stock Feeding—Agriculture 7	3
Applied Agriculture—Agriculture 8	2
Economic Ornithology—Zoölogy 4 *b*	2
Discussion of Experiment Station Bulletins—Agriculture 12	1
German—German 5; or Special Work—Agriculture 13	3
One Original Declamation—English 4.	

THIRD TERM.

Political Economy—Political Science 1	5
Agricultural Engineering—Agriculture 9	2
Stock Breeding and Experimental Agriculture—Agriculture 10 and 11	4
Discussion of Experiment Station Bulletins—Agriculture 12	1
German—German 6; or Logic—Philosophy 1	3
One Original Declamation—English 4.	

CHEMICAL DIVISION OF THE AGRICULTURAL COURSE

The work in this division is intended especially to fit for the profession of an agricultural chemist—for work in experiment stations, large dairy establishments, fertilizer works, etc. This field offers, perhaps, more inducements for investigation in chemical science than any other. The chemistry of plant or animal growth and nutrition is comparatively undeveloped, and offers a wide and profitable field for research.

Junior Year.

FIRST TERM.

	Hours per week.
How Crops Grow—Agriculture 1	3
German—German 1	3
Plant Diseases—Botany 4	2
Zoölogy—Zoölogy 1	3
Chemistry—Chemistry 5	5

One Original Declamation—English 3.

SECOND TERM.

Animal Nutrition—Agriculture 2	3
German—German 2	3
Geology—Geology 1	3
Chemistry—Chemistry 6	5
Applied Chemistry—Chemistry 7	2

One Original Declamation—English 3.

THIRD TERM.

Entomology—Zoölogy 3	5
German—German 3	3
Chemistry—Chemistry 6	5
Applied Chemistry—Chemistry 7	2

One Original Declamation—English 3.

Senior Year.

FIRST TERM.

Constitutional Law and Laws of Business—Political Science 2 and 3	5
German—German 4	3
Chemistry—Chemistry 9	5
Organic Chemistry—Chemistry 10	2
Chemical Journals, Methods, etc.—Chemistry 11	1

One Original Declamation—English 4.

SECOND TERM.

Astronomy—Physics 10	4
Sanitary Engineering—Engineering 12	1

Hours per week.

German—German 5 3
Chemistry—Chemistry 9 5
Chemical Philosophy—Chemistry 12 2
Chemical Journals, Methods, etc.—Chemistry 11 1
One Original Declamation—English 4.

THIRD TERM.

Political Economy—Political Science 1 5
German—German 6 3
Chemistry—Chemistry 9 5
Chemical Philosophy—Chemistry 12 2
Chemical Journals, Methods, etc.—Chemistry 11 1
One Original Declamation—English 4.

BIOLOGICAL DIVISION OF THE AGRICULTURAL COURSE

Students desiring to make a special study of the biological sciences relating to Agriculture—such as botany, entomology, economic zoölogy, etc.—may elect the following schedule for their last two years:

Junior Year.

FIRST TERM.

Hours per week.

Zoölogy—Zoölogy 1 3
How Crops Grow—Agriculture 1 3
German—German 1 3
Chemistry—Chemistry 5 5
Plant Diseases—Botany 4 2
One Original Declamation—English 3.

SECOND TERM.

Animal Nutrition—Agriculture 2 3
Geology—Geology 1 3
German—German 2 3
Chemistry—Chemistry 6 3
Animal Biology—Zoölogy 2 4
One Original Declamation—English 3.

THIRD TERM.

	Hours per week.
Entomology—Zoölogy 3	5
German—German 3	3
Logic—Philosophy 1	3
Agriculture—Agriculture 5	3
Ethics—Philosophy 2	2
One Original Declamation—English 3.	

SENIOR YEAR.

FIRST TERM.

Laws of Business and Constitutional Law—Political Science 2 and 3	5
German—German 4	3
Botany—Botany 5; or Zoölogy—Zoölogy 5 and 6	6
Biological Literature—Zoölogy 7	2
One Original Declamation—English 4.	

SECOND TERM.

Astronomy—Physics 10	4
Sanitary Science—Engineering 12	1
German—German 5	3
Ornithology—Zoölogy 4	4
Botany—Botany 5; or Zoölogy—Zoölogy 5 and 6	4
One Original Declamation—English 4.	

THIRD TERM.

Political Economy—Political Science 1	5
German—German 6	3
American Literature—English 8	3
Botany—Botany 5; or Zoölogy—Zoölogy 5 and 6	5
One Original Declamation—English 4.	

COURSE IN TECHNICAL CHEMISTRY

This course is designed to meet the needs of the general professional chemist. Those desiring to give their chief time to agricultural chemical research and analysis are advised to take the Agricultural course, giving their last two years to the Chemical Division of that course.

JUNIOR YEAR.

FIRST TERM.

	Hours per week.
Chemistry—Chemistry 5	5
German—German 1	3
Physical Laboratory—Physics 4	3
How Crops Grow—Agriculture 1	3
Plant Diseases—Botany 4	2

One Original Declamation—English 3.

SECOND TERM.

Chemistry—Chemistry 6	5
German—German 2	3
Physical Laboratory—Physics 5	3
Geology—Geology 1	3
Applied Chemistry—Chemistry 7	2

One Original Declamation—English 3.

THIRD TERM.

Chemistry—Chemistry 6	5
German—German 3	3
Physical Laboratory—Physics 6	3
Applied Chemistry—Chemistry 7	2
Machine Shop—Shop Work 2 *a*	2

One Original Declamation—English 3.

SENIOR YEAR.

FIRST TERM.

Chemistry—Chemistry 9	5
Organic Chemistry—Chemistry 10	2
German—German 4	3
Constitutional Law and Laws of Business—Political Science 2 and 3	5
Chemical Journals, Methods, etc.—Chemistry 11	1

One Original Declamation—English 4.

SECOND TERM.

	Hours per week.
Chemistry—Chemistry 9	5
German—German 5	3
Astronomy—Physics 10	4
Sanitary Engineering—Engineering 12	1
Chemical Philosophy—Chemistry 12	2
Chemical Journals, Methods, etc.—Chemistry 11	1
One Original Declamation—English 4.	

THIRD TERM.

Chemistry—Chemistry 9	5
German—German 6	3
Political Economy—Political Science 1	5
Chemical Philosophy—Chemistry 12	2
Chemical Journals, Methods, etc.—Chemistry 11	1
One Original Declamation—English 4.	

COURSE IN MECHANICAL ENGINEERING

JUNIOR YEAR.

FIRST TERM.

Mechanism—Engineering 2	5
French*—French 4; or German—German 4	3
Chemistry—Chemistry 1	3
Physical Laboratory—Physics 4	3
Shop Work—Shop Work 2 *a*	2
One Original Declamation—English 3.	

SECOND TERM.

Mechanics of Engineering—Engineering 3 *a*	5
French*—French 5; or German—German 5	3
Chemistry—Chemistry 2	3
Physical Laboratory—Physics 5	3
Shop Work—Shop Work 2*b*	2
One Original Declamation—English 3.	

*Engineering students who take French in Freshman year take German in the two following years. Engineering students who take History in Freshman year may elect between two years of French and two years of German.

THIRD TERM.

	Hours per week.
Mechanics of Engineering—Engineering 3 *b*	5
French—French 6; or German—German 6	3
Mineralogy—Geology 2	3
Physical Laboratory—Physics 6	3
Shop Work—Shop Work 2 *c*	2
One Original Declamation—English 3.	

Senior Year.

FIRST TERM.

Materials of Construction—Engineering 4	4
Thermodynamics—Engineering 5	3
Chemistry—Chemistry 5	2
Drawing—Drawing 3 *c*	2
Shop Work—Shop Work 2 *d*	3
Mechanical Laboratory—Engineering 8 *a*	2
One Original Declamation—English 4.	

SECOND TERM.

Thermodynamics—Engineering 5	3
Chemistry—Chemistry 6	2
Mechanical Laboratory—Engineering 8 *b*	3
Machine Design—Engineering 9	4
Shop Work—Shop Work 2 *e*	3
Work on Thesis	1
One Original Declamation—English 4.	

THIRD TERM.

Political Economy—Political Science 1	5
Heat Motors and Refrigerating Machines—Engineering 6	3
Mechanical Laboratory—Engineering 8 *c*	2
Shop Work—Shop Work 2 *f*	3
Work on Thesis	3
One Original Declamation—English 4.	

COURSE IN ELECTRICAL ENGINEERING

For three years the course is the same as the course in Mechanical Engineering. The work of the fourth year is almost entirely technical. Recitations and lectures are supplemented by work in the laboratories and by the inspection and study of machinery in operation.

For the latter purpose the electric lighting and electric street railway systems in operation within ten miles of the college furnish excellent opportunities. Even more valuable will be a central station, on the alternating system, operated by the college itself, which the student will be enabled to study and test.

Junior Year.

Same as the Mechanical Engineering Course.

Senior Year.

FIRST TERM.

	Hours per week.
Materials of Construction—Engineering 4	4
Thermodynamics—Engineering 5	3
Chemistry—Chemistry 5	2
Drawing—Drawing 3 *c*	2
Dynamo-Electric Machinery—Engineering 7	5

One Original Declamation—English 4.

SECOND TERM.

Thermodynamics—Engineering 5	3
Chemistry—Chemistry 6	2
Mechanical Laboratory—Engineering 8 *b*	3
Dynamo Design—Engineering 10	4
Electrical Laboratory—Physics 7	3
Work on Thesis	1

One Original Declamation—English 4.

THIRD TERM.

Political Economy—Political Science 1	5
Heat Motors—Engineering 6	3
Electrical Laboratory—Physics 8	2
Electrical Installations—Engineering 11	3
Work on Thesis	3

One Original Declamation—English 4.

GENERAL COURSE

JUNIOR YEAR.

FIRST TERM.

	Hours per week.
German—German 1	3
Laboratory work in Chemistry 5	5
One Original Declamation—English 3.	

Elective, eight hours per week, from the following:

How Crops Grow—Agriculture 1	3
Plant Diseases—Botany 4	2
Laboratory Work in Physics—Physics 4	3
Analytic Geometry—Mathematics 5	5
Zoölogy—Zoölogy 1	3

SECOND TERM.

German—German 2	3
English Literature—English 7	3
One Original Declamation—English 3.	

Elective, ten hours per week, from the following:

Animal Nutrition—Agriculture 3	3
Geology—Geology 1	3
Laboratory Work in Chemistry—Chemistry 6	3 to 5
Laboratory Work in Physics—Physics 5	3
Animal Biology—Zoölogy 2	3
Calculus—Mathematics 6	5

THIRD TERM.

German—German 3	3
Political Economy—Political Science 1	5
One Original Declamation—English 3.	

Elective, eight hours per week, from the following:

Entomology—Zoölogy 3	5
Logic—Philosophy 1	3
Laboratory Work in Chemistry—Chemistry 6	3 or 5
Laboratory Work in Physics—Physics 6	3
Calculus—Mathematics 6	5

Senior Year.

FIRST TERM.

	Hours per week.
Constitutional Law and Laws of Business—Political Science 2 and 3	5
German—German 4	3
One Original Declamation—English 4.	

Elective, eight hours per week, from the following:

American Political History—History 4	3
Advanced Work in Physical Laboratory—Physics 9	3
Laboratory Work in Chemistry—Chemistry 9	3 to 5
Advanced Botany—Botany 5	4
Advanced Zoölogy—Zoölogy 5 and 6	4 or 5

SECOND TERM.

Astronomy and Sanitary Science—Physics 10 and Engineering 12	5
German—German 5	3
One Original Declamation—English 4.	

Elective, eight hours per week, from the following:

Advanced Political Economy—Political Science 4	3
Advanced Work in Physical Laboratory—Physics 9	3
Laboratory Work in Chemistry—Chemistry 9	3 or 5
Advanced Botany—Botany 5	4
Advanced Zoölogy—Zoölogy 6 and 7	4 or 5
Meteorology—Geology 3	2
Ornithology—Zoölogy 4 *a*	2

THIRD TERM.

American Literature—English 8	4
German—German 6	3
Work on Thesis.	
One Original Declamation—English 4.	

Elective, four to six exercises per week, from the following:

Advanced Work in Physical Laboratory—Physics 9	3
Laboratory Work in Chemistry—Chemistry 9	3 or 5
Advanced Botany—Botany 5	4
Advanced Zoölogy—Zoölogy 5 and 6	4 or 5
Roads—Engineering 13	2
Ethics—Philosophy 2	2

SUMMER SCHOOL OF BIOLOGY

The impetus recently given to nature-study in the secondary and lower schools has led to a demand for the more thorough preparation of teachers in the essentials of botany and zoölogy. Teachers cannot get special training in these branches during the college year, because it coincides with their teaching year. In the past their opportunities for getting it during the summer have been limited, on account of the lack of summer schools.

To meet this demand the New Hampshire College, coöperating with Superintendent Gowing of the State Department of Public Instruction, has instituted a Summer School of Biology, especially adapted to the needs of teachers. It is held in the laboratories and class rooms of Thompson Hall, students being granted free use of the library, microscopes, aquaria, collections and other facilities. The laboratory instruction is supplemented by work in the field and class room, and by informal discussions of such topics as are likely to prove useful for illustrative purposes in nature-study in the lower schools.

The course of study covers the line of work in botany and zoölogy recommended in the recent report of the Committee on Secondary School Studies, appointed by the National Educational Association for adoption by the secondary schools. A certificate is given to those who satisfactorily complete the course.

The situation of the college is peculiarly favorable to the study of natural history. Plants and animals inhabiting a great variety of land surface, as well as fresh, brackish, and salt water, are easily accessible.

A programme of the school for 1895 will be issued during the winter, and may be obtained on application to the President.

Applicants may address,

PRESIDENT CHARLES S. MURKLAND,
Durham, N. H.

INSTITUTE COURSE IN AGRICULTURE

This course is intended for those who desire a better understanding of the science and practice of Agriculture, but who are unable to pursue the regular course.

The course is expected to prepare men for an intelligent home study of practical agricultural problems. Instruction will be given by means of lectures and laboratory work, the faculty being assisted by specialists. Students will be required to take notes, and join in the discussion which

will frequently follow the lectures. Those interested in particular subjects will be given all available facilities to inform themselves by means of practical work.

The average expense of attendance upon this course will be about $20. This estimate includes railroad fares, room, and board.

An important feature of the course for 1895 will be a practical dairy school, in which the students will become familiar with modern dairy methods through practice in the creamery.

A complete programme of the course will be issued in December. For further information apply to President C. S. Murkland.

NON-RESIDENT COURSE IN AGRICULTURE

This course is primarily designed to meet the needs of those farmers' sons who are unable to leave home to attend college, but who feel the want of the fuller knowledge of their work which the college offers.

The instruction in this course is given mainly by correspondence. Where several of the students live near together members of the faculty give lectures in person at occasional intervals, thus bringing the course into line with both the Chatauqua and University Extension movements.

The best standard books, selected Experiment Station bulletins, and pamphlets written by practical specialists are used. In this way it is hoped to make it a progressive course along practical lines.

The methods of the course are briefly as follows:

1. It is free to all, with no entrance examination or fee. The student can begin at any time; and the privileges of the course are not limited to residents of New Hampshire.

2. Students may work for a certificate or not, as they see fit, but they are strongly urged to do the former. Those who work for certificate will, as studies are finished, send in answers to sets of examination questions: others will submit a statement that they have carefully read the specified works.

3. Each book and each pamphlet is estimated at a certain number of exercises, an exercise averaging ten pages of reading matter.

4. The satisfactory completion of six hundred exercises entitles the student to a certificate. Under ordinary conditions this requires an hour's reading each day, five days a week, for two years.

5. Each student working for a certificate will be required to take certain general studies, such as Soils, Tillage, Noxious Insects, Fungous

Diseases, Meteorology, Laws of Plant Growth, Farm and Household Chemistry, Fertilizers, etc., and to select at least three lines of study from the following or similar subjects:

Dairying.	Orchard Fruits.
Stock-feeding.	Small Fruits.
Stock-breeding.	Vegetables.
Poultry-keeping.	Floriculture.
Field Crops.	Plant Propagation.
Forestry.	Road Construction.

Students not working for a certificate may select any of the above subjects they desire, but it is recommended that they pursue the prescribed lines of general reading in connection with special subjects.

6. The cost of books is not great. As far as possible the college furnishes bulletins free, and books at lowest cost.

It is expected that where several students live near together, the members of the faculty will be able to deliver lectures in person at occasional intervals, thus bringing the course into line with the University Extension movement.

The coöperation of granges, farmers' clubs, village improvement societies, and other organizations is earnestly desired.

Apply, stating what subjects you wish to study, to

PRESIDENT C. S. MURKLAND,
Durham, N. H.

GENERAL INFORMATION

ATTENDANCE

All regular students are required to attend chapel and rhetoricals, and to register for at least sixteen exercises per week.

PRIZES

I. THE SMYTH PRIZES.—Hon. Frederick Smyth, of Manchester, N. H., offers to members of the Senior and Junior classes two prizes, one of twenty dollars and the other of ten, for the best essays on subjects connected with agriculture or the mechanic arts; also three prizes, one of twenty, one of fifteen, and one of ten dollars, for excellence in oratory, open to the upper classes; also two prizes for reading, one of fifteen and one of ten dollars, open to the lower classes.

II. BAILEY PRIZE.—Dr. C. H. Bailey, of Gardner, Mass., and E. A. Bailey, B. S., of Winchendon, Mass., offer a prize of ten dollars for proficiency in chemistry.

III. ERSKINE MASON MEMORIAL PRIZE.—Mrs. Erskine Mason, of Stamford, Conn., has invested one hundred dollars as a memorial of her son, a member of the class of '93, the income from which is to be given, for the present, to that member of the Senior class who has made the greatest improvement during his course.

DEGREES

The degree of Bachelor of Science will be conferred upon those who complete a four years course, or its equivalent, and pass the final examinations. Each candidate for a degree must prepare a thesis on some subject relating to the course of study taken.

The college offers opportunities for post-graduate study in agricultural, scientific, and engineering lines. After the satisfactory completion of an appropriate amount of work, advanced degrees will be given.

CONANT HALL.

BUILDINGS

THOMPSON HALL

Thompson Hall, the main college building, has a length of 128 feet, exclusive of the porte cochère, which is forty feet long, and a width of 93 feet in the widest part. It is built of granite and brick, and has three stories besides the basement.

One half of the first floor and basement is devoted to the library, which is provided with a large, well lighted reading room for papers and magazines, a reference room for special work, a librarian's room, a delivery room, and shelf space for fifty thousand volumes.

The remainder of the first floor is used for offices, recitations rooms, and a waiting room for women.

On the second floor are more offices and recitation rooms, and the botanical and zoölogical laboratories and the museum.

On the third floor is the large hall used as an auditorium, two literary society rooms, and the bell-boy's room.

The building is lighted by gas and electricity, and provided with the most approved system of heating and ventilation.

CONANT HALL.

[Chemical and Physical Laboratories.]

Conant Hall contains the laboratories and lecture rooms for instruction in chemistry, physics, and electrical engineering. It is a substantial brick building, 92 by 70 feet, and three stories high, including the basement. It is heated by steam brought from the shops, lighted by gas and electricity, and provided with a system of thorough ventilation. Water, gas, high pressure steam, hydrogen, oxygen, vacuum, and blast are supplied through pipes wherever needed, and the lecture rooms, in addition, have switches controlling both dynamo and battery currents, and arrangements for stereopticon illustration.

The basement contains a small work shop, the battery, photometer, photographic, and comparator rooms, a clock room protected by double walls against changes of temperature, an acid room, and a water and gas laboratory, provided with the necessary fixtures and appliances.

The first floor, with the exception of one room, is occupied by the physics department. It contains the mineralogical laboratory, which is

provided with tile-covered desks and other facilities for blowpipe analysis; the junior physical laboratory; an apparatus room; a reading and reference room for physical and electrical books and periodicals; an electrical laboratory, from the neighborhood of which masses of iron have been excluded, so that magnetic measurements can be made with a good degree of accuracy; and the physical lecture room, which is provided with all necessary conveniences, as before mentioned. For optical experiments the room can be darkened by means of special window-shutters, operated from one of the lecture desks. A stone pier between the two desks makes it possible to use delicate instruments.

The second floor is given up entirely to the chemical department. It contains storerooms, an organic laboratory, a qualitative laboratory, a private laboratory, a dark room for polariscopic and spectroscopic work, a lecture room provided with facilities as before described, a quantitative laboratory, and a room to contain the delicate chemical balances and most important reference works.

The laboratories are fitted up with the most modern accessories, and with special reference to the kind of work to be performed in each.

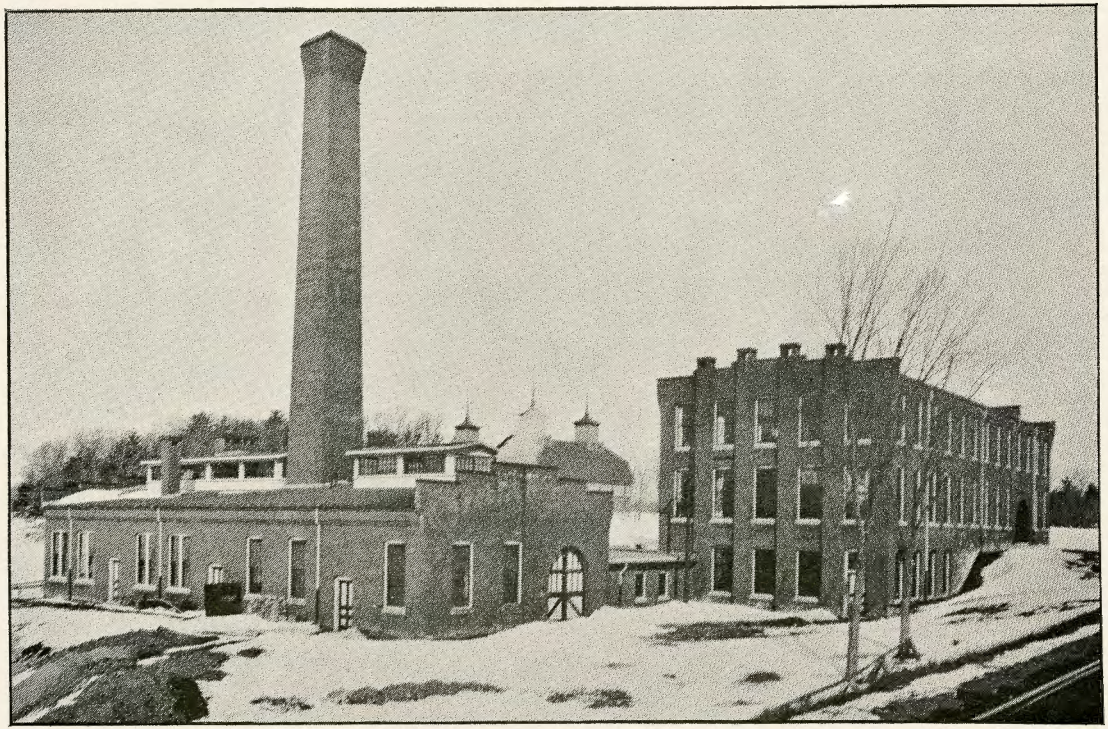
THE SHOP BUILDINGS.

The shops have been planned and built with the object of providing facilities for instruction in the working of wood and metals, and in the design, construction, care, and management of machinery. Incorporated with the shops is a central station for furnishing heat, light, water, and power, wherever needed in any of the college buildings; and the machinery of this station forms a part of the material equipment of the engineering departments.

The main shop building is 42 by 106 feet, and two stories high, with a basement 31 by 42 feet. In a separate one-story building, 40 by 100 feet, on a level with the basement of the main building, are the boiler house, forge shop, coal shed, and foundry.

In the boiler room, three boilers, aggregating one hundred and sixty horse-power, furnish steam to all the college buildings, wherever needed for heating or power. A brick chimney 95 feet high has been built to carry away the waste gases from the furnaces. The coal room provides for the storage of two hundred tons of coal conveniently near the boilers.

The basement of the main shop building is used as an engine room, containing a forty horse-power engine, furnishing power for the shops



Work Shops

and for the electric lighting; a dynamo for lighting the college buildings and campus; and the large steam pump, which receives water by gravity from the reservoir one half mile distant and forces it through underground mains to the various hydrants and buildings. The engine room serves as a power laboratory, and the machines mentioned, with others, will give to students opportunity for making efficiency tests.

On the first floor of the main shop building, a lavatory is provided. The largest room on this floor is the machine shop, where there is opportunity for practice in the operations of working metals by cutting ools, both by hand work and by machinery.

The second floor of this building is mainly occupied by a wood shop, in which the common branches of carpentry, joinery, and pattern making are taught. Practice is given in the use of carpenter's tools, and in the care and operation of the machines of most general use in woodworking. A well lighted corner of this room is partioned off, and will be equipped for copying drawings by the blue process. Two office rooms are also provided, one of which will temporarily be used as a recitation room, the other as a drawing room.

The shop buildings are constructed on the "slow-burning" principle, with thick walls and heavy continuous plank floors. The rooms are all well lighted and well ventilated.

APPARATUS, LIBRARY, AND FARM.

The various chemical laboratories are supplied with a full line of such apparatus as is required in each. Besides all necessary glass and porcelain ware, this includes water baths; drying ovens, combustion, muffle, and assay furnaces; platinum dishes and crucibles; polariscope; spectroscope; balances; lantern and other lecture appliances, etc.

The physical laboratory is equipped with a good collection of the usual apparatus for laboratory work and lecture room illustration, to which will be continually added pieces purchased or made in the college shop.

In electricity and magnetism the equipment includes instruments of high precision, and of the latest forms, for the measurement of current electro-motive force and resistance, as well as others of less accuracy for elementary work.

For more strictly electrical engineering work the department has the five-hundred light alternator used in lighting the college buildings, a direct-current "exciter" dynamo, all the apparatus of a complete fifty-five light Edison isolated electric lighting plant, a Sorley storage bat-

tery of twenty-six cells, arc and incandescent lamps, and standard forms of voltmeter, ammeter, and transformer.

The zoölogical laboratory is well supplied with aquaria, microscopes, dissecting tools, charts, reference-books, collections, etc.

The botanical laboratory is supplied with a good herbarium, microscopes, and the other necessary appliances.

The surveying instruments are sufficient in number and of the most approved pattern.

MUSEUM.

The museum had for a nucleus the collections made during the state geological survey. To this additions have been made from various sources. Many specimens are being collected to illustrate zoölogy—especially entomology. It occupies a large, well lighted room in the main building.

LIBRARY.

The library of the college consists of about thirty-five hundred bound volumes besides pamphlets. A considerable part of these are new and expensive books, making good working libraries for the different departments of instruction, including economic science and English and American literature.

Students also have the free use of the Durham public library of about thirty-five hundred well selected volumes.

The college supports a reading-room, which is well supplied with the leading American and foreign periodicals.

FARM.

The farm contains more than three hundred acres of valuable land. It has been provided partly from the funds given by Hon. John Conant and partly from the Benjamin Thompson estate.

It is used for the purpose of an experiment station, for which it is considered by leading agriculturists as being especially fitted.

A model barn has been erected, at an expense of about ten thousand dollars.

SITUATION AND RAILROAD CONNECTIONS

Durham is situated on the western division of the Boston & Maine railroad, sixty-two miles from Boston, and about midway between Newmarket Junction and the city of Dover, being five miles from the latter place.

From nearly every part of the state it is easily reached over the Boston & Maine and Concord & Montreal railroads. Each of these roads sells a transferable, unlimited mileage ticket at the rate of two cents per mile.

PECUNIARY AID AND EXPENSES

Tuition is $60 per year, although numerous scholarships give free tuition to many New Hampshire students. The trustees have arranged the scholarships as follows: There are thirty Conant scholarships, each paying $40 and tuition, $60,—total, $100. These are to be assigned under the following conditions: 1. They are to be given to young men taking an agricultural course; 2. Each town in Cheshire county is entitled to one scholarship, and Jaffrey is entitled to two; 3. Scholarships not taken by students from Cheshire country, and those in excess of the number of towns, are to be assigned to agricultural students at the discretion of the Faculty.

There are twenty-four senatorial scholarships—one for each senatorial district. Each scholarship is to pay tuition, $60. Senatorial scholarships not filled can be assigned to students from other localities at the discretion of the Faculty; they are open to students in all courses.

Early application should be made for these scholarships. They will be reserved for those respective towns and districts until August 1 of each year, after which they may be otherwise assigned for the year.

These scholarships are given for the purpose of aiding deserving students, and will be withdrawn from those who use tobacco or intoxicating liquors, or show themselves not deserving. Janitorships, work on the farm, etc., also furnish assistance to a considerable extent.

Expenses may be estimated as follows:

Tuition	Free	$60.00
Text-books	$10.00	20.00
Library and reading-room tax	6.00	6.00
Room rent, including fuel	18.00 to	40.00
Board $3 per week, for 35 weeks	105.00 to	122.50
Total	$139.00	$298.50

Room rent is estimated on the supposition that two students occupy the same room.

Rooms may be obtained either furnished or unfurnished.

For further information, address President Charles S. Murkland, or Prof. C. M. Weed, Secretary of the Faculty.

AGRICULTURAL EXPERIMENT STATION

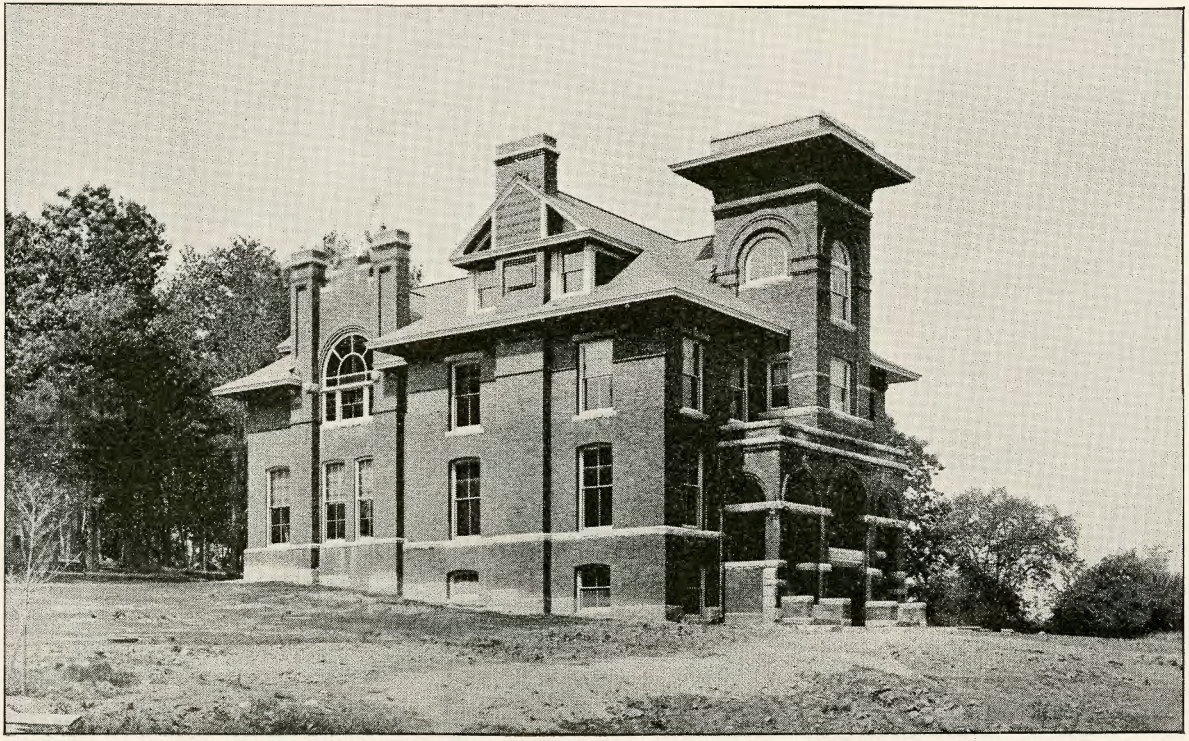
This department of the college is provided for by the national government, at an annual expense of fifteen thousand dollars.

The act of congress provides,—

That it shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals; the diseases to which they are severally subject, with the remedies for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping, as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the chemical composition of manures, natural or artificial, with experiments designed to test their comparative effects on crops of different kinds; the adaptation and value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective states or territories.

NESMITH HALL.

Nesmith Hall, a brick building two stories in height, is used for the work of the Agricultural Experiment Station. It contains offices and working rooms, a reference library, a chemical laboratory, a bacteriological and microscopical laboratory, and an agricultural museum.



NESMITH HALL.

BOARD OF CONTROL

HON. GEORGE A. WASON, *President*	New Boston.
PRES. CHAS. S. MURKLAND, *ex-officio*	Durham.
CHARLES W. STONE, A. M., *Secretary*	East Andover.
HON. JOHN G. TALLANT	Pembroke.
HENRY W. KEYES	Haverhill.

STATION COUNCIL

CHARLES S. MURKLAND, A. M., PH. D., *President.*
GEORGE H. WHITCHER, B. S., *Director.*
CHARLES H. PETTEE, A. M., C. E., *Meteorologist.*
ALBERT H. WOOD., B. S.. *Superintendent of Dairy Department.*
FRED W. MORSE, B. S., *Chemist.*
HERBERT H. LAMSON, M. D., *Microscopist and Photographer.*
CLARENCE M. WEED, D. Sc., *Entomologist.*

EDWARD P. STONE, B. S., *Assistant Chemist.*
FRED D. FULLER, B. S., *Assistant in Chemistry.*
FREDERICK W. HOWE, B. S., *Assistant in Chemistry.*
RUEL SEABURY ALDEN, B. S., *Farm Superintendent.*

PRIZE RECORD FOR 1894

SMYTH PRIZES

GIVEN BY HON. FREDERICK SMYTH, OF MANCHESTER, N. H.

Speakers:
1st. Fred W. Gunn.
2d. Lewis H. Kittredge.
3d. Frank S. Adams.

Readers:
1st. John L. T. Shaw.
2d. Abbie F. Chamberlin.

BAILEY CHEMICAL PRIZE

GIVEN BY DR. C. H. BAILEY, OF GARDNER, MASS., AND E. A. BAILEY, B. S., OF WINCHENDON, MASS.

Frederick W. Howe, Hollis.

ERSKINE MASON MEMORIAL PRIZE

Fred W. Gunn, Keene.

EXPERIMENT STATION BARN.

ENTRANCE EXAMINATION PAPERS*

I. ENGLISH

The composition should be correct in spelling, grammar, and punctuation, and should show a clear purpose and an orderly method.

1. Write at least three pages on one of the following subjects:
   (1.) The Combat between Sohrab and Rustum.
   (2.) Sir Roger at the Play.
   (3.) The School Days of David Copperfield.
2. Correct the errors in the following sentences.
   (1.) The boy stood on the burning deck,
   Whence all but he had fled.
   (2.) I am going and see him this afternoon.
   (3.) He had n't seen what he had ought to do.
   (4.) Get up on to the platform.
   (5.) Try and read as many a good book as you can.
   (6.) I guess he will resign, for he told he was going to.
3. Which is the right expression:

He felt badly at his loss, or, He felt bad at his loss. If you substitute "discouraged" for "badly" or "bad" in the above, what part of speech will it be?

II. AMERICAN HISTORY

1. Give a brief account of the conquest of Peru.
2. What nations held territory in North America during the seventeenth century? What did each nation hold?
3. Give an account of King Philip's War.
4. Give an outline of the French and Indian War.
5. Give a brief but comprehensive account of the Siege of Yorktown (1781).
6. Give a brief account of the adoption of the Constitution.
7. Give the causes and results of the Mexican War.
8. Give a brief account of each acquisition of United States territory.

* Given as specimens of average papers.

9. Give an account of the principal military operations during the year 1864.

10. Explain the Emancipation Proclamation and the Alabama claims.

III. PHYSIOLOGY

1. Explain the structure of the bones. Name in their order those of the limbs.

2. Define the terms, *cartilage*, *ligaments*, *tendons*.

3. Explain the process of digestion. What four solvents act upon the food?

4. How is the blood purified?

5. What is the origin of the nerves that regulate sensation and motion? What the origin of those that regulate digestion?

6. Describe the organ of hearing.

7. Describe the organ of sight.

8. What is the effect of alcohol upon digestion? upon the liver and kidneys?

IV. ARITHMETIC

1. Reduce $\frac{12012}{103740}$ to its lowest terms.

2. Divide $\frac{3}{2}$ of $\frac{5}{6}$ by $\frac{\frac{5}{3}}{\frac{4}{6}}$ and subtract the quotient from $\frac{2\frac{1}{2}}{4-\frac{2}{3}}$

3. How many hectares in a rectangular piece of land 500 meters long and 25 meters wide?

4. The population of a certain city is 100,000. It has gained 20,000; what has been the gain per cent.?

5. Extract the square root of $\frac{6\frac{1}{4}}{2\frac{1}{4}}$ to five decimal places.

6. If 4 men build 19 rods of wall in $2\frac{1}{2}$ days, in how many days will 7 men build 20 rods?

7. A, B, and C formed a partnership, and cleared $12,000. A put in $8,000 for 4 months, and then added $2,000 for 6 months; B put in $16,000 for 3 months, and then, withdrawing half his capital, continued the remainder for 5 months longer; C put in $13,500 for 7 months. How divide the profits?

8. Find the simple, the annual, and the compound interest on $1,000 for 2 years, 5 months, and 7 days, at 6 per cent.

V. ALGEBRA

1. Define algebra, formula, coefficient, power, root, exponent, radical, term, factor, similar quantities.

2. From $3ax^2-(4a-2x)\ (x+2a)+a\ [y-\ (a+2y)\ ]$ subtract $5a\ (x-y)+3a^2-2x^2(a+1)$.

3. Multiply $a^2x^{\frac{1}{3}}-3x$ by $b+2x^{-2}$.

4. Divide $4a^2y^{\frac{2}{3}}x^{\frac{2}{3}}$ by $-2a^3yx^2$.

5. $4x-5y=10$, and $3x+12y=7$. Solve for x and y.

6. Factor a^3-x^3; a^3+x^3; and a^4-x^4.

7. The sum of two numbers is a, and their difference is b. What are the numbers?

8. Multiply $\sqrt{-x}$, $-\sqrt{-y}$, $-\sqrt{y}$, and $\sqrt{y}$.

9. $\sqrt{x-16}=8-\sqrt{x}$. Solve for x.

VI. PLANE GEOMETRY

1. Define geometry, proposition, theorem, problem, axiom, postulate, corollary, scholium, right angle, perpendicular, parallel, magnitude, and form.

2. Define trapezoid, rhombus, regular polygon, apothem, sector of a circle and segment of a circle. Name and explain the different kinds of triangles.

3. Give expressions for the circumference and area of a circle. State the relations existing between similar areas.

4. Demonstrate that if a perpendicular be erected at the middle of a line, any point in that perpendicular is equally distant from the extremities of the line; also that any point without is nearer the extremity on its own side of the perpendicular.

5. Demonstrate that if two lines are cut by a third, making the sum of the interior angles on the same side of the secant line equal to two right angles, the two lines are parallel.

6. Demonstrate that in the same or equal circles two incommensurable arcs are to each other as the angles which they subtend at the centre.

7. Demonstrate that the opposite sides of a parallelogram are equal.

8. Demonstrate that triangles mutually equiangular are similar.

9. Construct a fourth proportional to three lines.

EXAMINATIONS FOR ADVANCED STANDING

Students passing the examinations in Ancient, Mediæval, and Modern History can take French iu place of the History of the first year.

I. ANCIENT HISTORY

1. Describe the Accadian libraries, and explain the manner in which they have been preserved.

2. Give an outline of the story of the War of the Seven against Thebes.

3. Compare the laws of Lycurgus with those of Solon.

4. Describe the different orders of Grecian architecture. Briefly describe the Parthenon.

5. Who were the great tragic poets of the Greeks? Upon what subjects did they write?

6. Give some account of the Stoics and the Epicureans.

7. Name and locate the natural entrances into the basin of the Mediterranean.

8. State the six provisions of the Licinian laws. Which provisions were effective?

9. Give an outline of the history of the second Sammite War.

10. Locate and, with a sentence for each, describe the following: Olympia, Ægina, Delphi, Thebes, Tarentum, Pannonia, Numidia, Etruria, Mauritania, Sardinia.

II. MEDIÆVAL HISTORY

1. Give an outline of the history of the kingdom of the Ostrogoths.

2. Explain the meaning of each of the following words: Janizaries, reliefs, escheats, aids, villeins.

3. What were the characteristics which distinguished the early Teutons?

4. Give an account of the Third Crusade.

5. In one hundred words give the history of Spain from A. D. 700 to A. D. 1500.

6. In the same number of words give the history of the Wars of the Roses.

7–8. Describe the following, using about fifty words for each: Tamerlane, Warwick (the "king-maker"), Simon de Montfort, Huss.

9. Give an account of cathedral building.

10. Draw a map showing the political divisions of Europe at the close of the Middle Ages.

III. MODERN HISTORY

1. Explain the causes that checked the progress of the Reformation.

2. Give an account of the Battle of Lepanto.

3. Give an account of the religious changes which took place in England during the Tudor period.

4. Give the history of the siege of Leyden.

5. Give an account of Catherine de Medici.

6. Give the history of the war undertaken by Louis XIV against Holland.

7. Give an account of the English revolution of 1688.

8. Give a brief account of each of the revolutions in France since 1815.

9. Give an outline of the history of the unification of Italy.

10. Draw a map showing the south-eastern part of Europe and the present political divisions.

CATALOGUE OF GRADUATES

NOTE.—The arrangement is : (*a*) Name in full. (*b*) Degrees taken. (*c*) Residence at time of entering college. (*d*) Occupation, etc. (*e*) Present residence.

1871.

William Preston Ballard, B. S., Concord. Farmer. *Concord.*
Lewis Perkins, B. S., Hampton. Civil Engineer.
North Adams, Mass.
Charles Henry Sanders, B. S., Penacook. Architect and Merchant.
Penacook.

3—

1872.

Edwin Bartlett, B. S., Bath. Farmer. County treasurer, 1883.
Kinsley, Edwards Co., Kan.
Frank Alexander White, B. S., Bow. Farmer. *Bow.*

2—

1873.

Frederick Erasmus Eldredge, B. S., Kensington. Lawyer.
Tacoma, Wash.
James Fred Smith, B. S., A. M. (1885). Instructor in Iowa College.
Grinnell, Iowa.
Charles Henry Tucker, B. S., Plaistow. Carriage Maker.
Amesbury, Mass.

3—

1874.

Millard Fillmore Hardy, B. S., Nelson. Graduated Theo. Inst. Ct. 1878. Clergyman. *Harrisville.*
Henry Abbott Sawyer, B. S., North Weare. Business. *North Weare.*

2—

1875.

Walter Herman Aldrich, B. S., M. D. (Univ. N. Y. City, 1880), Troy. Physician. *Marlborough.*
Frank Pierce Curtis, B. S., Stoddard. Manager of Store.
Greenfield, Mass.

Frank Veranus Emerson, B. S., Lebanon. Manufacturer.
East Lebanon.

Charles Webster Hardy, B. S., M. D., (Mo. Med. Coll., 1881), Marlborough. Physician. *Waterville, Kan.*

Harvey Jewell, B. S., Winchester. Farmer. *Winchester.*

Charles Ormille Leavitt, B. S.,* Lebanon. Farmer. Died 1877.

John Loney McGregor, B. S., D. D. S. (Phila. Dental Coll., 1877), M. D. (1883), Whitefield. Physician. *Whitefield.*

Eliel Peck, B. S., Lebanon. Farmer and Printer, 1875–'80. Merchant. *Kimball, Minn.*

Ira William Ramsay, B. S., Walpole. Farmer. *Walpole.*

Orlando Leslie Seward, B. S., Keene. Architect. *Keene.*

Emery Mason Willard, B. S., Harrisville. Drug Clerk.
15 *Union St., Boston, Mass.*

11—*1

1876.

Herbert Cyril Aldrich, B. S., Troy. Insurance Agent. *Keene.*

Edmund Lawson Brigham, B. S., Jaffrey. Manufacturer.
Clinton, Mass.

Joseph Warren Butterfield, B. S., Westmoreland. Farmer.
North Montpelier, Vt.

Arthur Frank Chamberlain, B. S., Westmoreland. Commercial Traveller. 6543 *Woodlawn Park, Chicago, Ill.*

Anson Ballard Cross, B. S., Holyoke, Mass. Paper Maker.
Readsborough, Vt.

Warren Webster Kimball, B. S., Troy. Merchant. *Troy.*

Daniel Deeth Parker, B. S., Fitzwilliam. Manufacturer.
Gardner, Mass.

7—

1877.

Rollin Kirk Adair, B. S., Indian Territory. Farmer.
Locust Grove, Cherokee Nation, Indian Ter.

Homer Brooks, B. S., M. D. (N. Y. Hom. Med. Coll., 1881), Franconia. Physician. 342 *Washington St., Haverhill, Mass.*

John Washington Carson, B. S., Mont Vernon. Farmer.
Mont Vernon.

Charles Otto Chubert, B. S.,* Troy. Died.

Charles Albert Edwards, B. S., LL. B.* (State Univ., Iowa, 1880), Keene. Lawyer. Died, 1886.

William Francis Flint, B. S., Richmond. Farmer. *Winchester.*

Clinton Camillus Hall, B. S., Westmoreland. Farmer.
East Westmoreland.

John Goodrich Henry, B. S., M. D. (1880), Chesterfield. Physician.
Winchendon, Mass.

Charles Pitkin Hollister, B. S., North Montpelier, Vt. Farmer.
North Montpelier, Vt.

George Mirick Holman, B. S., M. D., Fitchburg, Mass. Instructor in Bryant & Stratton's Commercial College. *Boston, Mass.*

Charles Appleton Hubbard, B. S., Troy. Clerk. *Newton, Mass.*

Charles Augustus Wheeler, B. S., East Calais, Vt. Farmer.
Bracken, Coral Co., Texas.

Everard Whittimore, B. S., Fitzwilliam. Merchant. *Hudson, Mass.*

13—*2

1878.

Ezra Eastman Adams, B. S., Manchester. Auctioneer.
237 *and* 249 *Monroe St., Chicago, Ill.*

Elmer Kilburn, B. S., C. E.,* Marlow. Civil Engineer. Died, 1881.

Charles Edward Record, B. S., Fitchburg, Mass. Farmer.
Fitchburg, Mass.

3—*1

1879.

Charles Hardy Bailey, B. S., M. D. (1881). Physician.
Gardner, Mass.

Richard Clinton Chapin, B. S., Chicopee, Mass. Agent for Nonotuck Paper Company. *Holyoke, Mass.*

Lucius M. Cragin, B. S., Lempster. Farmer. *Springfield, Vt.*

Nathaniel Cutter Holmes, B. S.,* Amherst. Lawyer. Died, 1887.

Fred Charles Parker, B. S., Lempster. Merchant. *Acworth.*

George Henry Wilkins, B. S., M. D. (N. Y. Hom. Med. Coll., 1883), Amherst. Physician. *Palmer, Mass.*

6—*1

1880.

Charles Harvey Hood, B. S., Derry. Farmer. *Derry.*

1—

1881.

Edwin Thomas Aldrich, B. S., Troy. Insurance Clerk. *Keene.*

Henry Lyman Barnard, Troy. Clerk. *Troy.*

George Jordan Boardman, B. S.,* Lawrence, Mass. Medical Student. Died, 1886.

Edwin Franklin Bristol, B. S., Harwinton, Conn. Mechanic. *Ascutneyville, Vt.*

Artemas Terald Burleigh, B. S., Franklin. Merchant. *Tilton.*

Frank Dana Ely, B. S., Cavendish, Vt. Business. *Cavendish, Vt.*

Sanford Eugene Emery, B. S., LL. D. (Albany Law School, 1886). Proctorsville, Vt. Lawyer. *Proctorsville, Vt.*

Charles Herbert Hazen, B. S., Hartford, Vt. Farmer. *Hartford, Vt.*

Frank Marston, B. S., Hartford, Vt. Business. *Olcott Falls, Vt.*

William Augustus Megrath, B. S., M. D. (1885), Cavendish, Vt. Physician. *Loudon.*

Fred Townsend Stanton, B. S., Strafford. Farmer. *Strafford Corner.*

Victor Hugo Stickney, B. S., M. D. (1883), Tyson, Vt. Physician. *Dickinson, Dak.*

Samuel Austin Wallace, B. S., Ph. G. (Boston School of Pharmacy, 1886), West Hartford, Vt. Druggist. *Crookstone, Minn.*

George Herbert Whitcher, B. S., Strafford. Professor of Agriculture, and Director of Experiment Station. *Durham.*

14—*1

1882.

Harvey Lincoln Boutwell, B. S., LL. B. (Boston Univ., 1886), Hopkinton. Lawyer. 209 *Washington St., Boston, Mass.*

Dana Justin Bugbee, B. S., North Pomfret, Vt. Agent for Publishers. *North Pomfret, Vt.*

Robert Fletcher Burleigh, B. S., D. V. S. (Am. Veterinary Coll., 1885), M. D. (1887), Franklin. Instructor in Veterinary Science 1885–'88. Professor of Physiology and Veterinary Science, Kansas State Agricultural College, 1888–'89. Physician. *Rochester.*

La Forrest John Carpenter, B. S., Surry.

Edwin Preston Dewey, B. S., Hanover. Civil Engineer. *Malden, Mass.*

George Andrew Loveland, B. S., LL. B. (Univ. of N. Y., 1886), Norwich, Vt. Weather Bureau. *Crete, Neb.*

John Wright Mason, B. S., Hanover. Business. *Des Moines, Iowa.*

Harlan Addison Nichols, B. S., Derry. Weather Bureau. *Colorado, Texas.*

Frank Elmer Thompson, B. S., Stark. Lumberman. *Ridgeway, Penn.*

9—

1883.

Elmore Ferdinand Arnold, B. S., M. D. (Univ. City N. Y., 1885), Londonderry, Vt. Physician. *Londonderry, Vt.*

Frank Landor Bigelow, B. S., Proctorsville, Vt. Instructor in Mathematics and Sciences, Goddard Seminary, Barre, Vt., 1883–'86. Business. *Rutland, Vt.*

Frederick Stocks Birtwhistle, B. S., Troy. With American Consulate. *Cartagena, Colombia, S. A.*

Noice D. Bristol, B. S., Harwinton, Conn. Clergyman. *Hamilton, Kan.*

Fred Plummer Comings, B. S., Lee. Teacher. *South Yarmouth, Mass.*

Frank Harry Follansbee, B. S., Canaan. Railway Mail Clerk. *Canaan.*

Adams Clark French, B. S., Franklin Falls. Theological Student. *Chicago, Ill.*

James Edgar Gay, B. S., Tunbridge, Vt. Woolen Manufacturer. *Cavendish, Vt.*

Elmer Daniel Kelley, B. S., Franklin Falls. Farmer. *Franklin Falls.*

Alvah Benjamin Morgan, B. S., Canaan. Drug Clerk. *Lebanon.*

William Lincoln Whittier, B. S., Deerfield. Farmer. *Deerfield.*

Charles Minot Woodward, B. S., Hanover. Instructor in Agriculture, 1883–'84. Teacher. *Corsicana, Texas.*

12—

1884.

Ernest Smith Cummings, B. S.,* Lee. U. S. Signal Service. Died 1886.

Fred Carlos Davis, B. S., South Reading, Vt. Lawyer. *Springfield, Vt.*

Sylvester Miller Foster, B. S., Riverhead, L. I. Insurance Agent. *Riverhead, L. I.*

Herbert Harvey Kimball, B. S., Hopkinton. Weather Bureau. *Washington, D. C.*

Moses Bisbee Mann, B. S., Benton. Custom House Official. 74 *Upham St., Malden, Mass.*

George Milton Moore, Plymouth, Vt. Merchant. *Tyson, Vt.*

Ziba Amherst Norris, B. S., Lyme. Merchant. 1677 *Washington St., Boston, Mass.*

Edwin Chapin Thompson, B. S., Lee. Weather Bureau. *St. Paul, Minn.*

8—*1

1885.

George Ellsworth Adams, B. S., Weston, Vt. Weather Bureau. *Fort Duchesne, Utah.*

Ruel Seabury Alden, B. S., Lyme. Superintendent of College Farm. *Durham.*

Walter Eugene Angier, B. S., C. E. (1887), West Swanzey. Civil Engineer. *Memphis, Tenn.*

Edward Alonzo Bailey, B. S., West Swanzey. Attendant in Insane Asylum. *Winchendon, Mass.*

Phillips Greenleaf Bickford, B. S., Lyme. Teacher. *Farmington, Wash.*

Andrew Walter Brill, B. S., Riverhead, L. I. Seedsman and Florist. *Floral Park, Queens Co., N. Y.*

Paul Cuff Brooks, B. S., Boston, Mass. Clerk. 25 *Westminster St., Boston, Mass.*

Frank Jay Emerson, B. S., Epping. Clerk. *Portsmouth.*

Allen, Hazen, B. S., Hartford, Vt. Chemist of State Board of Health. *Lawrence, Mass.*

George Mayo Mullins, B. S., Londonderry. Farmer. *North Londonderry.*

Albert Henry Wood, B. S., Lebanon. Associate Professor of Agriculture. *Durham.*

11—

1886.

Frank Albert Davis, B. S., South Lee. Weather Bureau. *Boston, Mass.*

James Ellsworth Harvey, B. S., Surry. Photographer. *Surry.*

Belezar Stoianoff Ruevsky, B. S., Sistova, Bulgaria. Student of Veterinary Science. *Sistova, Bulgaria.*

Madison Templeton Thurber, B. S., Webster. Physician. *Grafton.*

Edward Hills Wason, B. S., New Boston. Lawyer. *Nashua.*

George Pillsbury Wood, B. S., Lebanon. Civil Engineer. *Roanoke, Va.*

6—

1887.

William Sprague Currier, B. S., Norwich, Vt. Weather Bureau. *Cleveland, Ohio.*

Arthur Woodbury Hardy, B. S., C. E. (1889), Hopkinton. Civil Engineer. *City Engineer's Office, Salt Lake City, Utah.*

George Albert Sanborn, B. S., Rochester. Teacher. *Rochester.*

Hiram Newton Savage, B. S., White River Junction, Vt. Engineer of San Diego Land Improvement Co. *National City, Cal.*

Bion Leland Waldron, B. S., Strafford. Weather Bureau. *Galveston, Texas.*

5—

1888.

Melvin Burnside Carr, B. S., North Haverhill. *Boston, Mass.*
Herbert Grant Davis, B. S., South Lee. Thomson-Houston Co. *Lynn, Mass.*
Edwin Chandler Gerrish, B. S., Webster. Civil Engineer. Office of Locks and Canals. *Lowell, Mass.*
William Nelson Hazen, B. S., C. E. (1890), Hartford, Vt. Civil Engineer. *East Berlin, Conn.*
Edward David O'Gara, Hanover. Farmer. *Hanover.*
George Elmer Porter, B. S., M. D. (1892), Hartford, Vt. Physician. *Chatham, Mass.*
George Jonathan Sargent, B. S., Canterbury. Civil Engineer. Office of Locks and Canals. *Lowell, Mass.*
John Warren Smith, B. S., Grafton. Weather Bureau. *Boston, Mass.*
George Elwin Walker, B. S., Littleton. Farmer. *Littleton.*

9—

1889.

Fred Harvey Colby, B. S., Hopkinton. Civil Engineer. *Zillah, Yakima Co., Wash.*
Linwood Carroll Gillis, B. S. Editor and Publisher. *Hanover.*
Louis Jerome Hutchinson, B. S., Norwich, Vt. Electrician. *Boston, Mass.*
John Lawrence Norris, B. S., Lyme. Clerk. 1677 *Washington St., Boston, Mass.*
Charles Walter Earl Scott, B. S., Winchester. Clerk. *Winchester.*
David Elmer Stone, B. S., Hartford, Vt. *Durham.*
Fred Washburn, B. S., West Springfield. Business. *Laconia.*

7—

1890.

John Young Jewett, B. S., Gilford. Civil Engineer. *Lakeport.*
Joseph Franklin Preston, B. S., Hanover. Clerk. 570 *Columbus Ave., Boston, Mass.*
Elihu Quimby Sanborn, B. S., Webster. Machinist.
Clarence Ira Slack, B. S., Norwich, Vt. With Vermont Marble Co. *West Rutland, Vt.*

4—

1891.

Ernest Gowell Cole, B. S., Hampton. Merchant. *Hampton.*
Russell Marden Everett, B. S., Chester. Teacher. *Dover, N. J.*

Edward Payson Stone, B. S., Canaan Centre. Assistant Chemist of Experiment Station. *Durham.*

3—

1892.

Percy Lovejoy Barker, B. S., Milford. Civil Engineer. *Hanover.*

Fred Driggs Fuller, B. S., Hanover. Assistant in Chemistry, Experiment Station. *Durham.*

Arthur Bennerzett Hough, B. S., Lebanon. Farmer. *Lebanon.*

Edward Monroe Stone, B. S., Marlborough. Civil Engineer. *Hanover.*

4—

1893.

Wilton Everett Britton, B. S., Keene. Horticulturist, Experiment Station. *New Haven, Conn.*

Frank John Bryant, B. S., Enfield. Teacher. *Enfield.*

Charles Elbert Hewitt, B. S., Hanover. Post Graduate Student in Electrical Engineering. *Cornell University, Ithaca, N. Y.*

Charles Lincoln Hubbard, B. S., Fitzwilliam. Draughtsman. *Providence, R. I.*

Orrin Moses James, B. S., Northwood. Civil Engineer. *Northwood Narrows.*

Arthur Whitmore Smith, B. S., Norwich, Vt. Post Graduate Student. *Wesleyan University, Middletown, Conn.*

6—

1894.

Bert Sargent Brown, B. S., Hanover. Foreman. *St. Johnsbury, Vt.*

Fred Willis Gunn, B. S., Keene. Student at Y. M. C. A. Training School. *Springfield, Mass.*

Frederick William Howe, B. S., Hollis. Assistant in Chemistry, Experiment Station. *Durham.*

3—

SUMMARY

Graduates, 1871–'94, inclusive (living, 146, dead, 7)	153
Agriculturists	30
Architects	2
Business pursuits	39
Chemists	3
Clergymen	2
Civil and Mechanical Engineers	11
Electricians	2
Lawyers	5
Manufacturers and Mechanics	8
Physicians	13
Post Graduate Students	7
Teachers	10
Unclassified	2
Unknown	2
Weather Bureau	9
Twice classified	2
Students in attendance, 1894–5	163
Number connected with college, 1871 to 1893, inclusive	432

CALENDAR.

1894.

JULY.

S.	M.	T.	W.	T.	F.	S.
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1895.

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1895.

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COMMENCEMENT ADDRESS

THE NEW IMPULSE IN EDUCATION

BY

HON. EDWIN WILLETS, WASHINGTON, D. C.

DELIVERED JUNE 6, 1894

COMMENCEMENT ADDRESS

BY HONORABLE EDWIN WILLITS, WASHINGTON, D. C.

The New Impulse in Education.

The world at this date has not agreed upon the requirements of a good education. Who taught Shakespeare grammar? Whence came his marvelous command of the English language? The librarian of one of the largest libraries in the country, himself a classically educated gentleman, recently remarked that he had seen and read more than five hundred, and had in his possession more than one hundred, letters written by Henry Clay, and that he had never found a false sentence or a mispelled word. Whence got he that accurate and persuasive diction? This same gentleman had read more than one hundred letters of Andrew Jackson; all were perfect in punctuation, in grammar and in rhetoric, and among them all he found but one mispelled word. Who taught him grammar or rhetoric? Clay was admitted to the bar before a copy of Lindley Murray's grammar reached these shores, and Andrew Jackson had become one of our most vigorous and renowned lawyers west of the Alleghanies before Murray issued his first edition. What library or museum has at this day a dog-eared copy of a grammar or rhetoric used or studied by Abraham Lincoln? Where is the evidence that Lincoln could parse a single sentence according to rule; and yet his fifteen minutes' speech at Gettysburg will be classic in literature long after the world shall have forgotten that it was preceded by a nearly two hours' oration by Edward Everett, in studied phrase and sounding periods.

Many hard questions are being asked at this time and the mood is willing, if not pliant. Why is it that from the time of Plato down, education has been essentially linguistic, including Latin, Greek, Grammar, Spelling, Orthography, Rhetoric,

Literature, Logic, Elocution, Oratory? The only competitor has been Mathematics, and that to only a moderate degree. It has been practically conceded that numbers and letters were the essential basis of mental discipline. But what is discipline? "The best study of mind is mind," was the motto. "Know thyself" was the range and scope of human effort. In all ages the boy was sent to the master of rhetoric, or to walk with some philosopher, to learn to speak fluently, and to reason and speculate cogently. This was discipline. The highest aspiration was to be a talker; the greatest man was the orator. Next to them was it to be a writer. We have not quite got over that feeling in this age.

Somehow the impression prevails that all other callings are menial. Let us canvass the reason for this.

1. In the first place, our literature is full of it. Why not? Literature lives by literature, and it should magnify its office. So from the first dawn of intellectual life the child learns that poetry and rhetoric and logic and thought and sentiment are of a higher plane than all else. Everybody sometime in his life drinks at the Pierian spring. There is a fascination in the power of an orator. I asked a man worth three millions, on the floor of congress, just after a fifteen minutes' speech by a noted public man, what he would give to be able to make that speech. "Give," said he, with all the humility of a man low down in the scale of being, "Give! I would give you a third of all I am worth." One young lady goes into the marriage market with no capital but her beauty; another with nothing but a substantial bank account. Literature rates the one high; the other low. Why? They both have commodities for sale and generally sell them very cheap. I cannot stop to enumerate all the fine distinctions and grades of what is high and what is low in literature and poetry, what is noble and what is menial; but it may be that we have not had a sensible judgment by an impartial, well equipped judge.

2. Somehow the world has the notion that as talking and writing are mental exercises, all other intellectual exercise is material and of a grosser type. Thought is divine; hence the mental philosopher is godlike!—all others are of the earth, earthy. Now I grant the divine essence of thought; it is the

life that is like unto that of Jehovah. But Jehovah did not sit on his throne and complacently study himself. He projected himself into creation and all along the footsteps of his work he established law and order and harmony. His mind went into his works, and it is found there to-day as truly in the material universe as in man's mental endowments. Who shall say that the man who follows the line of God's thought in his material universe has not the stars under his feet as truly as the man who seeks to understand the laws of his own mind? They are both God's laws, and their proper study is as noble in the one as in the other. The creation is the fruitage of Divine energy, and the man who enters it and traverses in a measure its development, and listens to the general symphony of its manifestations is on as high a plane as he who hides himself in his own personality, who tries to determine how sense becomes perception and reason becomes judgment. Who shall say that there is not discipline—mental discipline—of as high a grade in the one as in the other? Who shall say that Herschel and Newton and Gallileo and Kepler and Davy and Faraday, Watt and Stephenson were not as highly endowed mentally as a master of rhetoric or a propounder of syllogisms. The fallacy of the position so long and so persistently maintained by the schools is in the misconception that thought finds expression only in language, and that therefore its highest function is in talking. George Washington could not make a speech but he could command an army, found a nation, give sound advice, and die worth nearly a million of dollars. His line of thought was not exactly that of the typical college president, but the world will give him a reasonable share of intellectual credit. Napoleon shook every throne in Europe, but back of his thundering squadrons was a mind as active, as well poised, and as well disciplined as those of the most learned linguists in his dominions. These two men saw the relation of things and utilized them. In their respective spheres they shaped events with a purpose and with forethought, and not by chance.

So in the domain of science the best thoughts of the best men of the world have found full scope. The linguist sees only the gathering of a few sporadic facts, as isolated as the grains of a bag of sand, but another man with a ken almost divine will

hitch these facts together and find a law that binds the fact to the throne of God. This law has discipline in it, and every time a man has struck it he has been raised head and shoulders above the common head of rhetoricians and metaphysicians. Aristotle made a machine that facilitated the hitching of these facts together so as to find the law, and Bacon improved upon it. Sometimes these can evolve the law out of their own imaginations and hunt up the facts to demonstrate it. One of the most pleasing incidents in my early manhood was the stringing of the cable of the first suspension bridge across the Niagara river. You will recollect that a kite was used first to draw over the slender thread, which drew another larger, and that a larger one still, till finally the strong cable hung from shore to shore, bridging the mighty chasm; in the same way these men of science send across into the unknown beyond their slender thread and pass over it, fact after fact, till they find that their tentative thread is a law, as strong as the sinews of the Almighty. Again other men with less imagination hitch together their facts that seem in some way to have a relation to one another, spinning them out as the spider does his web into the unknown and the impassable, till like the same web blown by the breezes in the darkness it strikes something to which it fastens, and lo, a law fastened to the throne of God! Here are the induction and deduction of the subject, and there is discipline in them—reason, but no rhyme; thought in its highest and truest sense, but not in set phrases of the dialectician, who assumes a superiority not warranted by the results. No law of nature is in essence gross; otherwise the Creator of the law must himself be gross. A man who walks with God through his material universe is good company for anyone, and the world is taking him into good society at last.

There has been a great change in public sentiment on this subject in the last fifty years. What shall constitute a true education? The old cast iron plan of the classics and metaphysics has been broken, and the world is beginning to appreciate the fact that there is mental discipline in the study of the sciences, and at least for the age, as good discipline; that while in a sense it is different, there is as much vital strength and as much real breadth as in the old plan.

Not only this, but in the last twenty-five years men have begun to question purely intellectual education. There is a growing sentiment that the hand should be educated as well as the mind; and that in that education the mind would lose nothing of its native power, but would bring to its aid a skilled coadjutor. This means that manual labor is to be coveted, and not scorned.

A HOBBY.

Now, if I have a hobby it is in line with this changed sentiment. I am out of patience with this snobbish scorn for manual labor. I have a warm heart for a handy fellow, who can set up a bedstead with facility, or put up a stovepipe without profanity. What a helpless set of people we Americans are likely to become, if we do not put our hands to work as well as our wits; dependent upon importing our artisans and our hired girls. To be just, however, we must not be too sweeping. Our farmers still believe in good, wholesome, daily toil. That is the reason why the farmer's boy comes to the front in the city; why, from the farm are born into civic life the kings of commerce and the royal lineage of law, letters, and theology.

THE FARMER.

I hope it is not out of place on this auspicious occasion, and in the shadow of this institution, founded as it is to-day, to speak a few words about the farmer; not to make a plea for him; he does not need it; but to state a few facts.

1. In the first place, every man has a right to be a farmer; it is his natural right. Farming was mankind's primary right and, like all primary rights, it is fundamental. The world could get along after a fashion without kings and princes, lawyers and merchants, poets and, perhaps, priests, but let the world's agriculture be blasted and mankind would disappear as the snow flake in Mother Earth.

2. It is no disgrace to be a farmer. There is no disgrace in the proper exercise of a natural right. A man has no natural right to steal; therefore a thief is discarded from decent society. No man has a natural right to make another man a drunkard.

He who does so deliberately is marked with infamy. His occupation is disgraceful and always has been; policed, licensed, prohibited, regulated, discouraged. Not so with the farmer. The world has never policed, licensed, or regulated him. The sun shines in regal glory around his labors and the rain falls in benediction upon his fields. There is no disgrace there, but steady, honest co-operation with nature.

3. A farmer need not be a fool. Agriculture in the long ages has had to endure very much of ignorance, but nothing so much indicates its vitality as that it has survived the imposition. Agriculture and the Church have taken to their motherly bosom many crippled sons of Adam, but because in their maternal love they have not driven them forth, it is wrong to infer that they are the dumping ground for imbecility. It is the stock sneer of men who never, if they could help it, did a square day's work in their lives, to depreciate farming; any worthless cub, in their estimation, is good enough to be a farmer; while it is apparent to all candid minds that there is not in the whole universe of mind and matter, a field of wider scope for the best intellects than agriculture.

The time has come, so far as agriculture at least is concerned, to repel the sneer; and this generation has taken the work in hand to place the farmer in the position to which he is entitled. Heretofore asceticism has had its run through the farmer's house as well as in society. The farmer boy has heard it more than hinted that there is a higher life, an easier life, than the life on the farm. It matters not that nine tenths of these find, all too late, that it is a mistake; the old ascetic's notion that he who works the soil becomes gross, and that the less one has to do with it the more he attains the "All Soul," that has come down through the ages. We have superstitions, and impulses in our blood a thousand years old. This is one of them that has crawled out of a cloister. Heretofore, the so-called learned professions have had the right of way in literature; but today some of the keenest minds and sharpest pens are enlisted in the cause of labor on the farm and in the shop.

THE ARTISAN.

This reference to "the shop" has a significance at this time

that almost equals that relating to the farm. This generation has sent a large block of our population from the country to the city. It is fortunate for the city that so large a proportion of its increasing numbers is from the country. It is the country blood that gives health to the city life. But this large increase of city population has its problems and its perils. The farmer's son who leaves the green meadows for the golden pavements has industry and vigor and integrity. He is generally safe and sure. But what of the farmer's city grandson? What shall he do? The chances are that he has no habit of industry, and instead, a scorn for work. No trade or occupation and no will to acquire one, or will to exercise it, if he had one. He lives by his wits. His education has sharpened his wits without supplying the proper motive and the proper object upon which to operate. The result is, he preys upon society.

Our prisons are filled with occupationless intelligence. Give the city boy something to do, systematic, daily labor, and take him off the sidewalk, and you will, or may, diminish your prisons one half. Give him something that requires skill and intelligence. Busy fingers rarely steal. Sin of all kinds is the product, generally, of the unoccupied mind and heart and hands of man. If St. Anthony had washed himself, at least, once a week, had taken off his hair shirt and had turned his cell into a workshop, he would have seen no devils to fight. The best way to cool off a passion or control an appetite is to side track it into some laudable industry. This generation is waking up to the subject and from all quarters is coming up the demand that the state shall encourage labor, for labor's sake, on the farm and in the shop; the demand that society shall throttle the ascetic notion that manual labor is unmanly. It is a mistaken idea that learning a trade is not education, that the ability to work at some useful occupation does not enter into and compose an essential part of a man's intelligence. You remember what Ruskin says: "A boy cannot learn to make a straight shaving off a plank or drive a fine curve without faltering, or to lay a brick level in the mortar, without learning a multitude of other matters which lip of man could never teach him." A man that can shoe a horse well knows

more than the man holding the bridle. Skill is intelligence applied, and applied intelligence counts for more in the world than stores of knowledge unapplied. Give a man both knowledge and skill and you have a well-rounded intelligence; these, with a moral and religious training, will do much to keep him outside the prison walls, outside the criminal class.

But it is said that this new movement ignores culture. I deny it, when properly understood. There is to be cultivated intelligence in the new order of things. There may be, and it would be no great loss if there be, less of the lackadaisical, thin blooded, so-called culture, which has always preceded degeneracy. A broad-chested culture should be the companion of a virile race.

WHAT IS CULTURE?

The crude, uncultivated man is a waster of energy. Nature is exhaustless in power and resources, prolific in products and wasteful beyond computation. It takes a million acorns to make a single oak. A single pair of plants or insects, if given free fecundity, would not leave standing or living room for any other living thing. So nature is an exterminator as well as a producer. Progress is what is spared from extermination. Culture aids the sparing. Barbaric and half-civilized men killed more men in battle with clubs and spears and swords than the gatling gun of modern warfare. Codes and culture go hand in hand. Even the prize ring howls down the man who hits below the belt.

Culture is the gloved hand—it is the power without the laceration. Culture is an economist—it saves blood and with blood, life. But life has a voracious appetite and must eat or starve; so in the end nature as an exterminator would bring about equilibrium and no progress would be attained. What sense in hospitals and asylums, in aid societies and humane organizations if the magazines are empty? Better knock the aged and crippled and leprous in the head at once and save the supplies for the sound in body. There are just as many deaths in this world as births—what matters it to save or prolong life, if in the end nature restores equilibrium in spite of

culture? True, but saved and prolonged life adds to the stock on hand at any given time, and with it so much more of potentiality and possibility.

Culture, then, having increased life and wants, has assumed the responsibility of increased production. Now culture is not a creative faculty. It is simply an assistant to Nature and genius. It takes them by the hand and leads them to the best results. There is, some one has said, "always the best way of doing everything if it is but to boil an egg." Culture digs up the soil, waters the roots and increases the production many fold. It lubricates the machinery and the busy hum of the shop sings with an inspired joy over the birth of a new power. It grades down highways so that this increased production may come together and exchange wants and good wishes, and by these means leads man into higher life.

Neither is culture a negative quality, vapid, inane; it is health and good order. To begin with, it is a respecter of the rights of others. Nature has no regard for rights. There is eternal enmity between sticks and stones, rocks and stream, earth and sea, fire and water, big fishes and little fishes, wolf and lamb, hawk and bird; and of all things man is the most vicious. He not only destroys his fellows but he destroys himself—his appetite leads him captive to an untimely grave. Culture steps in and says: "Hands off—off from property, from life, from crime and vice," and the destruction is stayed. There is no creation here, but a saving of energy and production. The economy of equal rights has never been weighed or measured. Its history is that of civilization. Its history has never yet, in my judgment, been properly and justly written, for the reason that publicists have based progress too much on force. and political ethics on policy and material wealth. Force is not culture; wealth is not civilization. I protest against the brute element in our histories, and the mathematical tendencies in the literature of our political economists. Conscience has no more place in either than in a demonstration of mathematics. There was a sense of right before there was a law against larceny. Force did not make the law. I grant you force enforces it, but robbers never made a law against robbing. Force can quell a man, but it never converts him. It diminishes crime, it is true,

grow in the life that exemplifies this condition of culture without a thought of policy. Then there is evidence of culture. As soon as it smacks of tariff, of the shop, of policy, it is greed not culture. They pay, not because they are politic, but because they are in harmony with truth and truth elevates.

This culture is the unwritten law that compels society to do the right thing, at the right time, in the right way. Its order is an impulse rather than a law. When it has become a second nature, if by chance it never was first nature, it raises the race barbarism to civilization—the whole plane of manhood is elevated.

This general culture, then, is not a matter of a day nor an age. The elements of a constitution are to be found in the first glimmer of history. Our constitution, written little over a century ago, in many of its essentials is so old that the memory of man runneth not to the contrary. Law and liberty, culture and civilization, have come to us hand in hand, almost with equal pace. In the rapacity of the race, in the blood and wrong, in the fierce struggle for dominion, in the contest between peasant and baron, king and noble, in the dark hours of the darkest night, to humanity and human rights, amidst all, there comes down to us the occasional gleam of a better life, a brighter hope, as the harbinger of the peace and good will to all men that sometime is and was to come. May we help the advent of that glorious day by each one's attention to our personal culture, so that in the aggregate there shall be shining particles enough to golden the mass.

Much has been said and written about the means of culture. Some attribute its growth to the cultivation of letters, some to the study of man as man. So far as literature has preserved the best thought of men, it has furnished the soil for an increased product of cultured thought. Reason and memory are the primal faculties that distinguish us from the brute creation. Literature has embalmed them for the future. Aristotle invented the tool which has been a labor-saving machine in the region of classified thought from his day to this. Homer sang the song that has sounded its manifold changes in poetry for centuries. These men and others too numerous to mention invented processes and formulated aspirations that have been

inherited by succeeding times as so much capital for future intellectual growth and culture. How far mankind has improved upon the models set is an open question, but there is no doubt that at least in so far as they have led we have followed from barbarism to civilization.

Again there are those who believe that the study of Nature and Nature's laws, as embodied in the physical universe, accomplishes the most in the development of culture. To them comfort has almost been the synonym of culture. The man who made a tool to dig the soil, to fell the tree and shape it, to forge the iron, to build the home, and to make other tools for use and defense, was, they argue, a greater benefactor than Homer or Phidias, or the long line of poets, artists, orators, and logicians. A man with a comfortable home and clothing and certain and abundant food, has in the estimate of these philosophers made greater strides towards civilization than from all other causes combined. There is much force in the claim, for a song is but poor satisfaction to a hungry stomach, and there can be but little room for culture in a life devoted to perpetual struggle against famine and gold. The highest culture can come only to those independent of the elements, to those who have leisure which follows means temporal and intellectual.

Again, the claim is made that the chief source of the world's civilization comes from commerce, and by this is meant not only the exchange of commodities but the mingling of men in the many relations of society, the attrition of mind with mind, the comparison and satisfaction of wants, the desire for social intercourse, the necessary adjustment of conflicting interests, from which are expanded laws, customs, and good order. This claim is founded largely upon the fact that culture, as understood by the publicists generally, is rarely found in sparsely settled or isolated communities; that it is most highly developed in such nations only as are largely the sources of or are on the highway of the world's traffic. The man who has wants seeks the man who can satisfy them. The mutual relation is of advantage to both. Each is the debtor of the other and each seeks to conciliate and accommodate the other. This dependence upon one another ameliorates the condition and character

of both. A bargain is a long step in advance of rapine. A contract is the seed wheat of civilized society. It implies good faith, honesty, ability to perform, and industry and exertion to fill the obligation. Out of it grow credit, public and private enterprise, fixed purpose, and a stable condition of affairs. Confidence fills the sails of every sea and runs the busy wheels of the world's industries. This, in truth is good soil for culture.

UNION OF CULTURE AND LABOR.

There was comparatively little of the ascetic spirit in Greece and Rome in their best days. The physical powers were trained as well as the mental. After the downfall of both the world went into the dark ages, from which it emerged divided into two classes, monks and warriors, the monasteries including nearly all the intelligence and religion, the chivalry and the serfs but little of either. It took centuries to open the cloisters and diffuse their stores of knowledge and their habits of study and their means of culture among the masses. The divorce of the body and the mind has been of long standing, and modern times are slowly reuniting them.

It is for the best minds of our day to study the problem of this new impulse, and to devise the best methods of joining hand and eye, heart and will, intelligence and culture, in the generation just coming on to the threshold of life, so that it shall know how to work, at what to work, and not to be ashamed of work, and yet to preserve and promote true culture.

In view of all this, what is the lesson for New England, the source of so much to be praised by every patriotic citizen, the exemplar of thrift, liberty, intelligence, and culture to a mighty nation? She has depleted herself for the general good. Is her vitality waning? Are her strength and resources being exhausted? I have not taken much stock in the allegations, inspired by the hope, it may be, that she has about quit the raising of men, raising them in the fullest sense, for the west. There is, perhaps, just enough truth in the assertion to give it feet to run upon. Let us see.

It costs a thousand dollars to raise an able-bodied man.

This includes taxes, doctor's bills, and prayer meetings. Every able-bodied immigrant who reaches our shores with pluck, willingness to work, good habits, good morals, and loyalty to his adopted land, is a thousand dollar addition to its potential energy, its producing capital. In ante-bellum times a hearty Virginian slave was worth a thousand dollars in the open market for the cotton fields. It takes the substance of four acres of rich virgin soil to produce a mature man. Twenty-one years of annual cropping without the recuperative energies of nature and restoration by artificial means will make the soil as sterile as a bean-pod. The impoverishment of the soil of New England and Virginia is not due alone to the products carried off to market nor to the substance washed from their hills into the sea, but is due in large part to the substance that has gone into the men and women reared thereon, to the human beings that have walked away with the substance of the acres on their backs, in their bones and blood and muscles and in their brains. In the case of New England the great west has reaped a human harvest raised for its benefit without cost to itself and with immense loss to the east. In the case of Virginia the southern cotton fields were manned, equipped, and carried on by Virginia muscle grown at the expense of Virginia soil.

It costs, therefore, to make a man; it costs immensely to make a million men. It costs to make a generation, ten generations of men. Unless therefore science and intelligence handle the plow three generations will cart off or walk away with the productive capacity of a homestead; the more and denser the homesteads, the sooner the country will be despoiled of its virtue, fecundity, and fertility. Bear in mind that in large measure the multitudes you have sent forth to fructify and replenish the earth were warmed and impelled by wholesome farmer blood that had in it a strain of granite and of hardy New England rural life.

In so far as the agriculture of New England shall depreciate so far will your race lack that tone and that vigor that commands the respect and dominates the affairs of the communities of which it shall become citizens. It is important, therefore, that this primary source of its power and vitality should be

promoted and preserved. It is with surprise and pleasure that we of other states note the efforts you are making to restore your forests and farms, to put intelligence into your agriculture, to adapt your crops to changed conditions caused by cheap transportation, to ennoble the occupations and diversify the products of husbandry. It is with peculiar pleasure that I am with you to-day to witness this new seat of learning dedicated to Agriculture and Mechanic Arts in the very heart of New England. It is rendered possible by the foresight and patriotic impulse of a New England man, and promoted by another from your own state. Every state and territory in the Union will think none the less of the founder of the Industrial Education which these colleges inaugurated, and so fitly represent, that he came from "sterile" New England. It was born of her necessity, but is proving the most wholesome and satisfactory element in the education of the age. If the good people of these six New England states will stand by the possibilities of their Agricultural and Mechanical college, and will make these possibilities verities, they will retain their ascendencies. If they do not, what is now perhaps approaching equality will simply precede her decline and fall, and we may and will begin to write her history now. New England is the Anteus of the nineteenth century. Born of Neptune and Terra, she will be invincible so long as she keeps in contact with her mother, Earth. May no modern Hercules lift her feet therefrom and strangle her in the air.

COLLEGE CALENDAR.

1894,

September 6. First term of fifteen weeks began—Thursday morning.
December 19. First term ends—Wednesday night.

Winter Vacation of Three Weeks.

1895.

January 10. Second term of ten weeks begins—Thursday morning.
March 20. Second term ends—Wednesday night.

Spring Vacation of One Week.

March 28. Third term of ten weeks begins—Thursday morning.
June 3–4. Examinations for admission, beginning Monday, at 2 p. m.
June 4. Annual Examinations close—Tuesday noon.
June 4. Smyth Prize Reading and Speaking—Tuesday evening.
June 5. Commencement.

Summer Vacation of Thirteen Weeks.

September 3–4. Examinations for admission — beginning Tuesday, at 9 a. m.
September 5. First term of fifteen weeks begins—Thursday morning.
December 18. First term ends—Wednesday night.

Winter Vacation of Three Weeks.

1896.

January 9. Second term of ten weeks begins—Thursday morning.
March 19. Second term ends—Wednesday night.

Spring Vacation of One Week.

March 27. Third term of ten weeks begins—Thursday morning.
June 3–4. Third term ends.