

MAINE STATE LEGISLATURE

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PUBLIC DOCUMENTS OF MAINE

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

Public Officers ^{and} Institutions

FOR THE YEAR

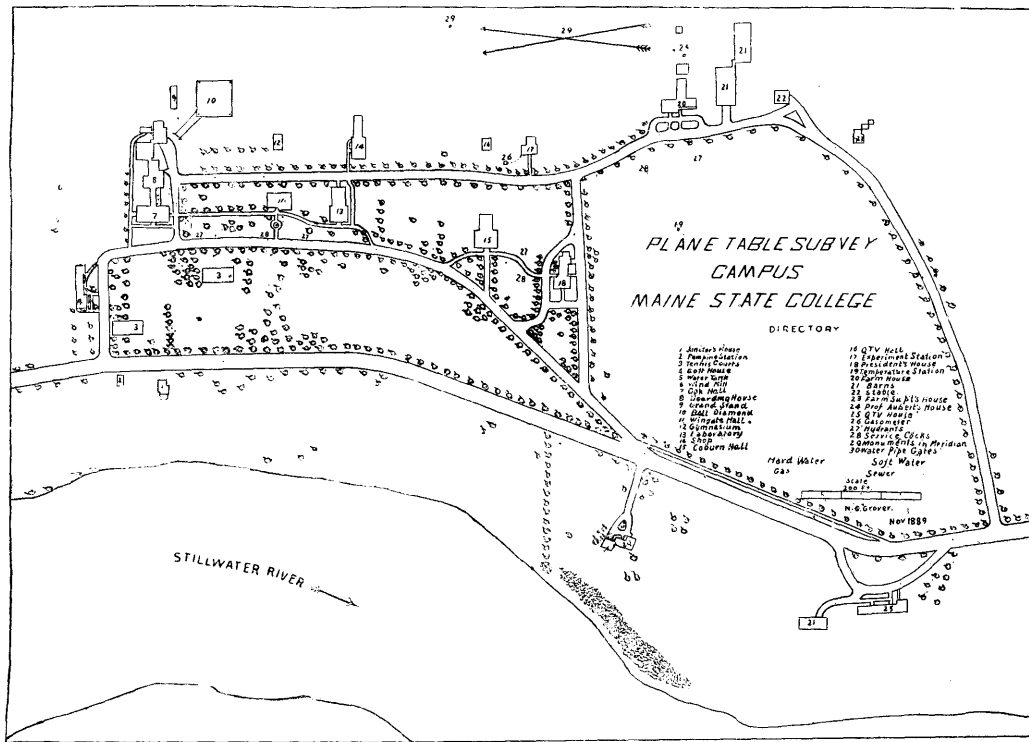
1891.

VOLUME II.

AUGUSTA:

BURLEIGH & FLYNT, PRINTERS TO THE STATE.

1892.



ANNUAL REPORTS

OF THE

TRUSTEES, PRESIDENT AND OTHER OFFICERS

OF THE

State College of Agriculture

AND THE MECHANIC ARTS.

Orono, Me., 1890.

Published agreeably to a Resolve approved February 25, 1871.

AUGUSTA :

BURLEIGH & FLYNT, PRINTERS TO THE STATE.

1891.

TRUSTEES' REPORT.

To His Excellency, the Governor, and the Honorable Council:

The Trustees of the Maine State College of Agriculture and the Mechanic Arts respectfully present their twenty-second annual report, including also the full reports of the President, the heads of departments in the College and the Treasurer.

The only changes in the Board within the past year have resulted from the expiration of the term of office of one member, and the appointment of another to fill his place. Capt. Charles W. Keyes of Farmington, a constant and warm friend of the college, served it faithfully during the period of his official relation to it, attending all the meetings of the Board and aiding in its deliberations until prevented by sickness in the closing part of the term of his appointment. His place in the Board is now filled by Hon. Rufus Prince of South Turner, Master of the State Grange, an earnest friend and advocate of agricultural and industrial progress.

For detailed information of the work of the institution, the trustees ask attention to the accompanying reports of the several departments. For specific recommendations in the interest of all departments, with reasons for the same, they ask attention to the report of the President.

Desiring to secure for the College a positive and symmetrical development, they have given very thoughtful consideration to all suggestions and recommendations having this end in view.

They have approved the several recommendations in the the President's report relative to new instructors and assist-

ants and a librarian, and have arranged for appointments to be made as services shall be needed. For the department of horticulture, an early appointment will be made. The plant-house provided for by action of the last legislature has been completed and will be brought into service early in 1891.

Believing that a course in agriculture requiring less time than the complete course may serve a useful purpose, the trustees have decided to establish a brief course extending over not more than two years, so arranged that it can be taken in parts or sections with something like completeness under each division.

Moreover, selections may be made from the arranged scheme of studies so as to make up a select or optional course requiring less than the prescribed time.

The course is designed to be eminently practical, and the instruction given, to find immediate expression or application in farm practice.

The arranging of the course is in the hands of a committee, and in due time needful information in regard to it will be published.

In connection with, or as a part of, the course in agriculture, the Trustees believe that definite dairy instruction should be given. They seek, therefore, to make provision for the course in dairying, and, that it may be carried out in the most complete manner, they ask legislative assistance, as shown later in this report.

In matters of instruction and government, the Trustees have the fullest confidence in the men upon whom these duties are imposed. As indicating their opinion on one phase of the matter of government, they insert a resolution unanimously adopted at their recent meeting at the College, as follows :

“*Voted*, That we approve the course of the Faculty in suspending members of the Sophomore class for hazing members of the Freshman class. That first of all we deem it the duty of the Faculty to maintain order and proper discipline in the College, and recommend that punishment be inflicted upon

those violating the rights of others and disobeying the regulations of the College, severe enough to break up all attempts at that old and barbarous custom known as hazing."

They believe that no young man who disregards the rights of others is entitled to the advantages offered by the State in this Institution, and that they will have the approval of all true citizens in upholding the Faculty in the use of most prompt and vigorous measures in dealing with such offences, under whatever name or form they may appear.

The needs of the College are so fully set forth in the report by the President, that it will be necessary in this place simply to reproduce the summary. The items are of such nature that they cannot fail to commend themselves to the good judgment of the legislature as necessary. The Trustees ask that provision be made for them by the appropriation of the amount named.

SUMMARY OF NEEDS.

New building to replace Wingate Hall	\$16,000 00
Foundry building	800 00
Cases in Coburn Hall, Dep't Natural History	600 00
Dairy building	2,500 00
Tool shed	500 00
Stand-pipe for fire protection	3,600 00
Hose and carriage	500 00

Total	\$24,500 00
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They regard it desirable to add to the above the sum of \$5,000 for engine and dynamos to serve for purposes of instruction in electrical engineering, and ask for this recommendation the special consideration of the legislative committee as well as the favorable action of the legislature. They favor the repeal of the law of 1879, requiring tuition, believing that, hereafter, the State should assume the full responsibility of the necessary expenses of the College above assured receipts.

In closing this report, the Trustees desire to congratulate the people of the State on the recent generous aid extended

to this College by the national government, and to express their thanks to our Senators and Representatives in Congress for their favor and support of the necessary legislation.

WM. H. STRICKLAND,
President of the Board of Trustees.

PRESIDENT'S REPORT.

To the Trustees of the Maine State College of Agriculture and the Mechanic Arts:

GENTLEMEN: The report which I have the honor to present, is not limited to the year 1890, but includes statements pertaining also to the year 1889, or in other words, it relates to the affairs of the college, requiring special notice, since the last session of the legislature.

APPROPRIATION FOR 1889.

For the information of the State officers and members of the legislature, I submit an itemized statement of the last appropriation, indicating the several amounts assigned and the purposes to which they were to be devoted.

For cancelling indebtedness arising from destruction of herd in 1886	\$6,000 00
Completing Experiment Station building....	400 00
Re-stocking farm	1,500 00
Coburn Hall, including cases, tables, chairs, &c.....	2,950 00
Gas fixtures.....	400 00
Library	1,000 00
Apparatus.....	2,900 00
Military department.....	100 00
Forges, drawing tables and sheathing room in Mechanical shop	300 00
Water supply and drainage of shop	200 00
Drawing tables, dep't of Civil Engineering,	200 00

For Steam heating apparatus, Chemical Laboratory	\$ 300 00
Repairs on buildings	1,500 00
Construction of road and for walks	500 00
Fitting up a Mineralogical room.....	1,000 00
Traveling expenses of Trustees	500 00
Insurance	250 00
Lathes and planers for iron working	4,000 00
Foundry	1,000 00
Construction of plant-house.....	2,000 00
Steam-pump, main and distributing pipes for supplying College with soft water	3,000 00
Total	<u>\$30,000 00</u>

As shown by the Treasurer's report the several sums have been assigned and devoted in accordance with the foregoing schedule with the slight modifications herewith stated.

In fitting up the mineralogical room in the chemical laboratory, it was thought that it would be necessary to raise the ell of the laboratory one story. On obtaining estimates of cost, it was found that the plan contemplated could not be carried out without an expenditure in excess of the sum appropriated for this purpose. The plan was accordingly modified, the necessary light being obtained by means of skylights and a large dormer window, and the room, supplied with steam-heating apparatus, with water and with gas, has been fitted up and equipped as a mineralogical room within the limits of the appropriation for it.

Since the burning of Wingate Hall in February 1890, the space in the mechanical shop designed for lathes and planers, has been so much needed for classes in drawing that the equipment in machinery for iron working has been but partially made. Accordingly, a portion of the sum assigned for this purpose has not been drawn from the college treasury, but will be used to complete the outfit as soon as the space can be spared for the machinery.

The demands upon the forge-room in the shop have also been so great, that it has been found necessary to extend this room to include the space heretofore designed for the foundry room.

Accordingly there is a delay in providing for this department of shop work.

With the exceptions given, the plans and purposes for which provision was made by the last legislature, have been fully carried out.

COMMENCEMENT PRIZES AND DEGREES.

The exercises of the Nineteenth Annual Commencement are shown by the following programme :

1890. June 21, Saturday, 7.30 P. M., Sophomore Prize Declamations.
- 22, Sunday, 7.30 P. M., Baccalaureate Address by the President of the College.
- 23, Monday, 7.30 P. M., Junior Exhibition.
- 24, Tuesday, 9.00 A. M., Meeting of Trustees.
1 P. M. to 4 P. M., College Halls open to visitors.
1.30 P. M., Military Exercises.
8.00 P. M., President's Reception.
- 25, Wednesday, 9.30 A. M., Commencement Exercises.
3.00 P. M., Meeting of Alumni.

The Prentiss Prize, for excellence in declamation, Sophomore class, was equally divided between Harry Mellen Prentiss, Brewer, and Roscoe Conkling Clark, Bethel, with honorable mention of William Cross Holden, South Windham. The Prentiss Prize, for excellence in composition, Junior class, was equally divided between Prescott Keyes, Litchfield Corner, and Fred Charles Moulton, Hiram, the writers respectively of the essays entitled "The Developing Influence of Labor" and "The Education of Woman," the Committee of Award making honorable mention of Henry Vaill Starrett,

Warren, writer of essay upon "Science Applied to Agriculture."

The Libbey Prize for best agricultural essay was awarded to Edward Havener Kelley of Belfast, writer of essay on "Nitrogen as a Food Supply of Plants."

The Prentiss Prizes are the gift of Mrs. H. E. Prentiss of Bangor, and the Libbey Prize, of Hon. Samuel Libbey of Orono.

At the late Commencement, Edward F. Danforth, Esq., of Skowhegan, established an Agricultural Prize, to be known as the "Franklin Danforth Memorial Prize," and to be given to the student attaining the highest rank in the agricultural course in the senior year. Edward Havener Kelley of Belfast was the recipient of this prize for the year 1889-90.

Awards for the highest standing in "scholarship and deportment" in the Sophomore and Freshmen classes were made through the liberality of a lady friend of the College.

In the Sophomore class, the award was equally shared by Herbert Edward Doolittle, Northfield, Mass. and Arthur Curtis Grover, West Bethel, each attaining a rank of 95.1 on the scale of 100; Robert Heywood Fernald, Orono, of the same class, attaining a rank of 94.8, received honorable mention.

In the Freshmen class, the award was made to Charles Henry Gannett, Augusta, who attained a rank of 98.7; George Weymouth Hutchinson, Orono, with a rank of 97.4, and James Almore Alexander, Richmond, with a rank of 96.8, receiving honorable mention.

The names of candidates who received degrees and the subjects of their essays are herewith given:

BACHELOR'S DEGREE.

Degree of Bachelor of Science—Course in Agriculture: George Pendleton Gould, Stillwater, Western Farming; Samuel Henry Tewksbury Hayes, Oxford, Why So Few Take the Agricultural Course; Edward Havener Kelley, Belfast,

American Antiquity ; George Melville Pillsbury, North Scarborough', Theory and Practice of Farming.

Degree of Bachelor of Science—Course in Chemistry : Ralph Harvey Blackington, Rockland, Prohibition ; Alphonzo John Coffin, Harrington, Domestic Dangers ; Edmund Needham Morrill, Deering, Americanized Europeans ; Frank Wade Sawyer, Milford, Naturalization ; Charles Sampson Williams, Portland, Right Use of the Ballot.

Degree of Bachelor of Science—Course in Science and Literature : Hannah Ellis (Leavitt) Flint, Orono, Education of Women.

Degree of Bachelor of Civil Engineering—Hugo Clark, Lincoln, Education of Specialists ; Nathan Clifford Grover, West Bethel, The Use of Railway Safety Apparatus ; Allen Crosby Hardison, Caribou, Origin and Growth of Engineering ; Chandler Cushman Harvey, Fort Fairfield, American Agriculture ; Elmer Lake Morey, Colombo, Ceylon, Monometallism ; John Wesley Owen, Jr., Saco, Origin and Growth of the Railway System ; Joseph Riley Rackliffe, Hampden, The Value of Men of Leisure ; Fullerton Paul Reed, Boothbay, Earthquakes ; Chester J. Wallace, Jackson, The Manufacture of Money ; Winfield Scott Webb, Caribou, Explosives ; Ralph Holbrook Wight, Belfast, Selection of a Water Supply.

Degree of Bachelor of Mechanical Engineering—Frank Orris Andrews, Rockland, The Puritan and the Cavalier ; George Herbert Babb, Sebago, Achievements of the Engineer ; John Bird 2d, Rockland, Development of the Steam Engine ; Walter Everett Croxford, Jackson, Knowledge and Scientific Training ; Fred Todd Dow, Gorham, Iron and Iron Production ; Albert Wilson Drew, Canaan, The Western Empire ; Harris Drummond Dunton, Boothbay, The Dynamo ; Horace Parker Farrington, Cape Elizabeth, Chinese Labor ; Everett Fenno Heath, Bangor, Electrical Engineering ; George Edwin Keyes, Hampden, Influence of Inventions on Civilization ; Varna John Pierce, Hudson, Banking ; William

Bridgham Pierce, Hudson, Our Coast Guard ; William Barron Pierce, Harpswell, The Census, Its Aims and Methods ; Fred Grant Quincy, Masardis, Bimetallism ; Clarence Buzzell Swan, Old Town, The Tariff.

MASTER'S DEGREE.

Master of Science—George Frederick Lull, Old Town, Thesis, Evaporation in Processes of Pulp Manufacture.

Civil Engineer—James Norris Hart, Orono, Thesis, The Establishment of a True Meridian, including the Determination of Latitude and Longitude ; Frank Eugene Hull, Warren, Thesis, Preliminary Surveys ; Frank Ellsworth Trask, Ontario, California, Thesis, A Determination of the Ontario Miner's Inch.

Mechanical Engineer—Harold Mason Plaisted, Springfield, Ohio.

The Degree of Civil Engineer was^{*} conferred also on two non-graduates, Frederick Heywood Butler, Cheyenne, Wyoming ; Charles C. Elwell, Wilmington, Delaware.

GRADUATES AND NON-GRADUATES.

The number of graduates is 328 of whom 310 are now living. The number of non-graduates exclusive of students now in the College, is 313 of whom 287 are now living. The whole number of different students who have obtained or are now obtaining their collegiate education at this institution is 753.

Of the 310 living graduates, the vocations of 246 are shown in the half dozen groups below.

AGRICULTURE AND ALLIED INDUSTRIES.

Farmers.....	22
Professors of Agriculture.....	2
Directors of Agricultural Exp't Stations.....	2
Chemists " " " "	4

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Veterinary Surgeons.....	3
Nurserymen.....	2
Florist.....	1
Ass't U. S. Bureau of Animal Industry.....	1
Editor of Agricultural Paper.....	1
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Total	38

CIVIL ENGINEERING AND ALLIED INDUSTRIES.

Civil Engineers.....	65
Professor Civil Engineering.....	1
Instructor " "	1
Superintendent Railroad.....	1
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Total	68

MECHANICAL ENGINEERING AND ALLIED INDUSTRIES.

Mechanical Engineers.....	12
Draughtsmen.....	22
Manufacturers	9
Architects.....	3
Professor Mechanical Engineering.	1
Instructors Mechanical Shop.....	3
Mining Engineers.....	2
Electrical Engineering	2
	<hr/>
Total	54

BUSINESS.

Merchants	10
Clerks	6
Travelling Salesmen.....	2
Banker.....	2
Bank Cashier.....	1
	<hr/>
Total	21

EDUCATION.

Teachers	26
Professors and Instructors in Colleges.....	12
Superintendent of Schools.....	1
	<hr/>
Total	39

PROFESSIONS.

Lawyers.....	15
Physicians.....	8
Clergyman.....	3
	<hr/>
Total	26

It thus appears that of the 310 living graduates 12 per cent are engaged in agriculture and allied industries, 17 per cent in mechanical engineering and allied industries and 22 per cent in civil engineering and allied industries or that 51 per cent are engaged in these three very important forms of industry; and that 7 per cent are employed in business, 13 per cent in the work of instruction and 8 per cent in the so-called professions. The 64 graduates not included in the above groups are engaged in varied callings.

It will be observed that but 8 per cent are in *professional* life, as the term is generally employed, and that 92 per cent are engaged in varied industries.

FINANCIAL EXHIBIT.

The endowment fund resulting from the sale of land-scrip furnished by the national government, amounting to \$118,300 is invested in a State bond paying five per centum. Of the \$13,000, interest accumulated on this fund, the sum of \$4,000 invested in the bonds of the Hallowell Scientific and Classical Academy pays no interest. The remaining \$9,000 yields interest at six per centum. The endowment therefore, derived from the national land-grant, amounting in all to \$131,300 yields an annual revenue to the College of \$6,455.

The Coburn fund, a gift of \$100,000, invested in a State bond at four per centum yields \$4,000 annually. From tuition, the annual receipts are a little more than \$3,000.

It thus appears that the ordinary revenue exclusive of State appropriations for current expenses, is between \$13,000 and \$14,000. This exhibit does not include the government aid to the experiment station since this appropriation is wholly devoted by law to a specific purpose and no part of it can be used for current college expenses.

The recent liberal provision by Congress for further aid of the land-grant colleges will increase very materially the annual revenue of this institution.

The State appropriations have amounted to \$277,218 in twenty-three years. Notwithstanding the recent loss of Wingate Hall, the buildings as now fitted up are valued at \$150,000; the apparatus including that of the Experiment Station at \$25,000; the library at \$10,000, the farm, tools, stock, carriages, etc., at \$20,000, making an aggregate of \$205,000.

The insurance money on Wingate Hall retained as fund in part for a new building is \$10,000.

LOSS OF WINGATE HALL.

In references heretofore made to the loss of this building, it has been assumed that the fact was generally known to the citizens of the State.

The fire by which this hall was destroyed occurred on Sunday morning at about eleven o'clock, February 9, 1890, only five days after the opening of the spring term. Eleven students had rooms in the building but it chanced very fortunately that but four were occupying their rooms at the time of the fire.

The cause of the fire is unknown. So far as known there was no defect in chimney or flues from which it could have originated. There was no known material in the building from which spontaneous combustion could have taken place.

It was natural, therefore, to suppose that it must have originated from an overheated stove in one of the rooms. The occupants of the building were at church when the fire occurred as were also most of the students and the families residing on the College campus. When discovered, the flames were making rapid headway in the upper story of the building. Those arriving first at the scene of the fire succeeded in removing from the two lower stories of the building, the drawing-tables, settees and chairs in the class-rooms and the transits, levels and other instruments belonging to the department of Civil Engineering. The organ belonging to the Young Men's Christian Association was also saved.

The principal individual losses were from the destruction of the third story of the building and consisted in the burning of furniture, clothes and books. It is pleasant to record in this connection that a subscription by the Faculty, by students and by citizens of Orono reimbursed the losers in part for their losses.

Although the engine companies of Orono, Stillwater and Old Town were speedily on the ground and the hydrants of the new water system near the hall enabled them to work to advantage, and every one worked heroically, it was found impossible to save the building. A strong northwest wind was prevailing at the time. The anemometer record shows that at the beginning of the fire, the wind was blowing at the rate of twenty miles an hour and that while it was prevailing, the wind rose to forty-eight miles an hour. The companies in which insurance had been effected, regarded the loss total and promptly paid the full amount of insurance on the building and a small amount for damage to apparatus.

The inconvenience and embarrassment arising from the loss of Wingate Hall, especially in the department of Civil Engineering, has been great, but an effort has been made to endure them philosophically while awaiting the new building which should take its place without delay and thus give the engineering departments a habitation as well as a name.

It is almost unnecessary to add that the new building should be of brick, and that the old site is the most desirable on the campus for the new structure.

INSTRUCTORS.

Since the last report was made no changes have occurred in the corps of instructors, and the work of instruction has been carried forward with energy, faithfulness and success.

The term of assignment of Lieut. Hatch as military instructor expires next July. Since his connection with the college, he has taught gratuitously one of the higher mathematical branches in accordance with a preference expressed by him before entering upon duty. I take this occasion to bear testimony to the good spirit he has constantly manifested, to his skill as a military officer and to his ability and efficiency as an instructor. I would respectfully suggest that an application be made for his re-appointment.

Professor W. F. Wentworth of Boston, Mass., has been employed for the past three years, several weeks each year in the latter part of the spring term, to give instruction in elocution preparatory to the commencement exercises. He has performed this duty with ability and success.

LIBRARY.

In the last report, the number of bound volumes in the college library was given 5,540, and in the part of the library assigned to the Experiment Station 507, making in all 6,047 to which students had access.

Within the year moderate additions have been made by binding, by exchanges, by purchase and by gifts. Among the gifts I desire to make special acknowledgment of fifty-three bound volumes and two pamphlets presented by Mrs. Elizabeth R. Weston of Dorchester, Mass.

The number of volumes now in the library is 5,700 and the number in the part of the library assigned to the Experi-

ment Station 509, making a total of 6,209, exclusive of duplicates and pamphlets.

The library is proving to be exceedingly useful to the students and to the members of the Faculty. I believe the time has arrived when the number of periodicals supplied to the library should be increased, when a considerable addition should be made to its books, especially of current publications, and when the needful expense should be incurred of keeping the library open the greater part of the time.

Besides the obvious advantages of such an arrangement, there would be an incidental advantage of no little value to students reciting in Coburn Hall, in the opportunity of utilizing in the library odd moments of time and sometimes a whole hour between recitations, which otherwise would be but partially available.

NATIONAL AID FOR THE COLLEGE AND PLANS FOR ITS DEVELOPMENT.

When two years ago, in the college report, I ventured to direct attention to the desirableness of fixed annual appropriations in order that permanent plans could be made, I little thought that before another session of the legislature, this hope for the college, long entertained, would be realized through the liberality and wise foresight of the national government.

Now that hope has changed to fulfilment, I am confident that the effort will be to secure for the college an harmonious development by establishing the conditions of increased prosperity in all its departments.

Briefly stated, the recent act of Congress provides for "the more complete endowment and support of the college for the benefit of agriculture and the mechanic arts, established under the provisions of an act of Congress approved July 2, 1862."

For this purpose, it appropriates for each college the sum of fifteen thousand dollars for the year ending June 30, 1890,

and this sum is increased by one thousand dollars each year, over the sum for the preceding year, until it amounts to twenty-five thousand dollars a year, at which annual sum, it remains thereafter without increase. With reference to its use, the act provides that it shall "be applied only 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."

On this point the terms of the act are explicit and ample, covering nearly all the branches now taught in the college, excepting the French and German languages, Psychology and Military Science.

The act further provides that "no portion of said moneys shall be applied, directly or indirectly, under any pretense whatever, to the purchase, erection, preservation or repair of any building or buildings." The obligation to provide for the necessary buildings and repairs still remains in the State. Its recent history in the matter of support and aid of the college is assurance that this obligation will be promptly and adequately met. Indeed, the bounty of the government would be illy bestowed on any State that would fail to respond to such obligation.

From a somewhat careful study of the educational problem we have been seeking to solve, and of the possibilities of usefulness now open to the college under its more generous endowment, I beg to submit certain considerations and suggestions relative to its future development.

The college now gives a most excellent course in agriculture, very satisfactory to all who pursue it. Tributary to it are a farm, buildings, stock, machinery and tools worth at least \$30,000. Tributary to it are a finely appointed chemical laboratory and apparatus, furnishing unquestioned facilities of investigation and instruction. Tributary to it are Coburn Hall and a fairly equipped department of Natural History. Tributary to it are the services in part of several professors

and instructors and nearly the entire services of one professor. The earlier graduates in this course occupy positions of responsibility in the line of their acquisitions while in college, and the more recent graduates are fast attaining to such positions, a credit to themselves and to the institution which graduated them. And yet the number of students who take this course is small. The fault, if fault there be, is not in the course, in the instruction given, or in the facilities available and tributary to it.

While no abatement should be made in this extended and valuable course, I believe the interests of agriculture in the State may be promoted by providing for a short course in which instruction shall be given only in those subjects intimately connected with practical agriculture. In working out the details of such a course, I would suggest the propriety and value of conference with representative men in the leading agricultural and horticultural organizations of the State.

In the line of agricultural instruction, I would suggest also a consideration of the advisability and feasibility of a winter course of lectures, at the college, for farmers.

The plant-house for which an appropriation was made by the last legislature is now completed and ready for use. I would suggest the appointment of a professor of horticulture to enter upon duty early in 1891, whose services shall be in part for the college and in part for the Experiment Station, and whose salary shall be paid in accordance with his services, in part by the college and in part by the station.

The recent act of Congress providing aid for colleges, emphasizes the value of instruction in the English language. The ability to write and speak the English language with facility and correctness is almost an education in itself. The necessary instruction and drill in rhetoric, theme-writing and elocution, in a word, in the correct and easy command of our mother-tongue, have, hitherto, been quite impossible. The appointment of an instructor especially trained for such teaching will be in the line of a true and much-needed development. Other duties can be assigned him.

The recent progress in the applications of electricity renders electrical engineering one of the most practical of industries and a course in electrical engineering almost a necessity in an institution whose training is directed to the varied and practical industries of life. I believe that such a course should be developed in this college as soon as the necessary funds can be commanded for it, and as tributary to its establishment, would recommend the appointment of a professor of physics and electrical engineering. In making this recommendation, I have in mind also to relieve myself of the work of instruction in physics (which I have performed for the past twenty years) in view of increasing executive duties.

For the department of civil engineering an assistant is needed to enter upon duty at the opening of the spring term, 1891, and for the department of chemistry an assistant, to enter upon duty at the beginning of the autumn term, 1891. Both appointments are recommended. I would also recommend the appointment of a librarian who can devote the larger part of his or her time to the interests of the library.

By way of more fully equipping the several departments, I would recommend the following allowances for apparatus:

Department of Agriculture.....	\$1,500 00
“ “ Natural History.....	2,000 00
“ “ Physics.....	1,000 00
“ “ Chemistry.....	1,200 00
“ “ Civil Engineering.....	1,500 00
“ “ Mechanical Engineering.....	1,500 00

For the library, including books, periodicals and binding, I would recommend an allowance of \$3,000.

If the amount expected from the national government, this year, shall be realized, the foregoing recommendations can be carried out without embarrassment, and the interests of all departments of the college be thereby promoted.

SCHOLARSHIPS.

In 1879, the legislature enacted a law requiring the Trustees to impose tuition. The receipts from this source are about \$3,000 a year.

The enactment of the law did not meet the approval of Trustees or Faculty, but it should now be said, the college has adjusted itself to the required condition and a disturbance of it would be of questionable utility. From conference with students, I am led to believe that, in the main, they would prefer paying a moderate tuition to receiving their tuition free. They are not oblivious to the fact that students can better afford to pay even a large tuition at an institution well-equipped and strong in all its departments, than to accept free tuition at an institution where the necessary equipments are wanting. The building up of a strong institution implies a liberal as well as a judicious expenditure of money.

Although the aid of the government will prove greatly helpful, I am confident it will be found inadequate to the development of this college on the scale that will be deemed essential in a few years.

My judgment, therefore, approves continuing the law relative to tuition as it now stands. In order, however, to provide for all cases in which deserving parties might find the payment of tuition a hardship, I would recommend that forty per cent of the tuition money each year be assigned for scholarships of thirty dollars each. The assignment of these scholarships at the discretion of the Faculty would give aid precisely where it would be most needed and where it would be best appreciated and utilized. The moral force, moreover, of scholarships to be won or retained by worthy achievement, is one of large value in any institution.

NEEDS.

The first and most obvious need is that of a new building in place of Wingate Hall destroyed by fire. Plans have been made by F. E. Kidder, C. E., Denver, Colorado, a graduate

of the college, who was also the architect of Coburn Hall. As planned, the building will contain the necessary recitation rooms, drawing rooms and apparatus rooms for the departments of civil and mechanical engineering, a physical apparatus room and lecture room, two recitation rooms and a room for the Young Men's Christian Association.

It is arranged with a bell tower and with space for a clock. It will cover about the same amount of ground space as Coburn Hall, and although contractors' estimates have not been made, the building will presumably cost about the same as did Coburn Hall. Including bell and clock in an approximate estimate, there will probably be needed to complete the building in addition to insurance money the sum of sixteen thousand dollars.

As stated in Prof. Flint's report the money appropriated for fitting up a foundry has not been used for want of space in the mechanical shop. Prof. Flint suggests a wooden building a little remote from the shop for the foundry, and estimates its cost at eight hundred dollars. In Prof. Harvey's report, attention is called to the need of more cases in Coburn Hall for the department of Natural History, the estimated expense of which is six hundred dollars.

In developing the course in agriculture not only for regular students but for those in the briefer course, it is believed that dairy instruction should be made prominent. If such instruction is to be made prominent and permanent, a suitable building appropriately equipped becomes a necessity. The estimated cost of this building is two thousand five hundred dollars. In this connection it should be stated that a toolshed for the farm is a long recognized need. Its cost is estimated at five hundred dollars.

One other need completes the present list. An admirable water system has been established by which soft water is supplied to the different buildings and to the stock. In order to give it full effectiveness for fire protection, a stand-pipe and hose and a carriage are needed. Their estimated cost is four

thousand one hundred dollars. Summarizing the needs as set forth, we have the following condensed list :

For new building to replace Wingate Hall.....	\$16,000 00
“ Foundry building.....	800 00
“ Cases in Coburn Hall Dep’t Nat. History..	600 00
“ Dairy building.....	2,500 00
“ Tool shed.....	500 00
“ Stand-pipe for fire protection.....	3,600 00
“ Hose and carriage.....	500 00
	<hr/>
Total.....	\$24,500 00

If instruction in electrical engineering is to be attempted, at least \$5,000 should be added to the above summary.

MISCELLANEOUS ITEMS.

Attention is directed to the specific reports of the several departments from which reports have been deemed essential.

No space is taken in this report for a review of the condition of the farm and stock or for presenting a *resume* of the work of the Experiment Station, since the former is fully set forth in the report by Professor Balentine, and the latter, by the published bulletins and reports of the station. It should be said that the assistance of the representatives of agricultural and horticultural organizations in the Station Council is greatly appreciated.

Mr. Kidder proposes to contribute his fees as architect of the new building to the founding of a scholarship, to be known as the “Kidder Scholarship.” Every scholarship established will prove a source of strength to the college.

CONCLUSION.

It gives me pleasure to state that the great majority of our students recognize the value to themselves of devotion to study, of obedience to regulations and of earnestness of effort, and that as a consequence, satisfactory progress has been

made by them during the past two years. My associates in the Faculty have labored with their accustomed earnestness and effectiveness.

In view of the generous and timely aid of the national government, by which the endowment of the college is virtually enlarged, and in view of the supplemental aid which the State may reasonably be expected to furnish, it is safe to assume that the college is entering upon a new era of prosperity. It will be the endeavor, I am sure, of all connected with it in whatever relations, to render this new era one of conspicuous and constantly increasing usefulness on the part of the college, and to this end we confidently invoke the aid of the State and the cooperation of all good citizens.

Respectfully submitted,

M. C. FERNALD, *President.*

Department of Agriculture.

President M. C. Fernald:

At the last commencement four students were graduated from the agricultural course of the college presenting essays on the following subjects:—Western Farming, George P. Gould; The Foot of the Horse, Samuel H. T. Hayes; Nitrogen of the Air as Food for Plants, Edward H. Kelley; Stock Breeding, George M. Pillsbury. Mr. Kelley's essay deserves special mention as being of high order. It was awarded the Libbey Prize for the best essay written by any student on an agricultural subject. The Franklin Danforth Memorial Prize for the highest rank taken by a member of the Senior class of the course of agriculture was also awarded to Mr. Kelley.

The passage of the Morrill bill by Congress at its last session, granting further aid to those colleges endowed by the general government, marks an epoch in the history of this institution. It will, without doubt, increase the usefulness of the agricultural department as well as the other departments of the college.

In the past it has been the aim of the college to give to the students in agriculture a training which should not only enable them to carry on the business of farming successfully, but to deal understandingly with those social problems which our form of government make it the duty of every citizen to take part in solving. The course, established with this object in view, should not, in my opinion, be abandoned. But as the time and expense of such a course is believed by some to prevent many young men, who intend to spend their



COBURN HALL.

lives upon farms, from taking a course in agriculture at the college, I recommend that a shorter course in agriculture be established which shall comprise the technical studies of the full course, taught, perhaps, in a more elementary manner, and so arranged that at the end of a term or a year certain definite lines of work will have been completed. Although the institution has always been open to special students since its foundation and but few young men have availed themselves of this opportunity of taking a short course in agriculture, it is believed that a course laid out as described above will make the college more useful to the farmers of the State.

The green-house about completed calls for instruction in horticulture which, I doubt not, will be provided by the trustees. The agricultural feature of the institution will be much strengthened by this addition. The greatest financial successes in agriculture are attained in these days in special lines of work. Maine's many summer resorts have opened home markets for large amounts of garden products, while its northern latitude enables us to produce small fruits and place them on the city markets after competition from southern points has ceased. The instruction which the college will be able to give in the direction of growing fruits and vegetables will enable young men to fit themselves for work in which a small capital brings comparatively large returns.

Dairying is a specialty in which there is a demand for young men who have been trained for the work. At the college farm a herd of cows must be kept to supply the boarding house with milk. A few more would furnish butter and cheese. An instructor in practical dairying in addition to the present class-room work would enable the college to fit young men to carry on this business successfully from the beginning. A building will be needed, fitted up especially for giving practical instruction to students, if this line of work is taken up. I earnestly recommend that provision be made for such instruction.

I would also recommend that theoretical and practical instruction be given, so far as the means of the institution

will admit, in the raising and management of stock of all kinds, and that from time to time special lecturers be called in to the work from outside the college faculty.

During the last three years I have had charge of the college farm in addition to my class-room work. If the short course in agriculture is adopted, it will require additional class-room work which necessitates relief from the immediate oversight of the farm on my part. I would recommend that a man be employed to take charge of the farm who is fitted to illustrate, for the benefit of the students, the best methods of cultivating crops by the use of improved tools and machinery, also the most approved methods of management of stock.

COLLEGE FARM.

The college farm has produced the past season one hundred and sixty-eight tons of hay, seventeen tons of barley in the straw, forty bushels of peas and some two hundred dollars worth of potatoes and other vegetables. The farm books show a net gain for the year of four hundred and eighty-five dollars and twelve cents. The inventory of farm property is appended to this report. A tool and cart house is much needed to protect tools and carts from the weather when not in use. Steps should also be taken to keep the water out of the barn cellar and for making various repairs about the farm buildings.

DISEASE.

It was discovered last October that two of the cattle imported from Massachusetts were afflicted with tuberculosis. For the benefit of those interested in the matter all of the facts relating to the appearance of the disease in the herd that have come to my knowledge are given below.

In May, 1890, the trustees placed upon the college farm the following Guernseys from the herd of Wm. P. Perkins of Wayland, Mass.: One five-year-old cow, Sard 4th, with calf at side; two two-year old heifers, Velma 2d and Wayland Lady; one yearling heifer, Marghieta.

From the herd of Wm. A. Russell, Lawrence, Mass., the following Holsteins: One seven-year-old cow, Nitalia; one bull calf, Archer Aberdare, and a three-year-old cow, Agnes Schmit, for the Experiment Station.

There were on the farm at the time of the above purchase five cows, the property of the Experiment Station, namely: One Holstein bought in this State; two Jerseys bought in this State; two Ayrshires bought in Vermont, and one Jersey bull, one-year-old, presented to the college farm by Mr. Brewer of Hingham, Mass.

There were added to the college farm herd the last of August seven grade cows and two Jersey two-year-old heifers all bought within the State. In December a Guernsey bull was added from the herd of Mr. Clark of Portland, Me.

There have been additions to the herd by birth of two yearling Jersey heifers, one of which is from an Experiment Station cow, the other from one of the heifers purchased for the college farm; two Jersey heifer calves from same cows; two yearling Guernseys out of Velma 2d and Wayland Lady; one Guernsey bull calf from Velma 2d; one yearling Ayrshire bull belonging to Experiment Station from station cow. The above named animals, thirty-three in all, comprise the college herd.

The cattle that came from Massachusetts were inspected, at the request of the trustees, by Dr. Bailey, in July, 1889, after their arrival at the college farm in May of the same year. The temperature of some of the animals was above what is considered normal. Dr. Bailey could see no reason for it, and requested Dr. Russell to take the temperature from time to time.

In November, 1889, Dr. Russell reported the range of temperatures found by him. In January following, Dr. Bailey sent Mr. Haines a bill of health for the herd or rather for the animals purchased by the trustees in Massachusetts. The herd has been carefully watched from the start for any indications of disease on account of previous experiences. When the stock came here in May, 1889, Sard 4th's calf was

scouring badly. By changing to other milk than its mother's and careful nursing, the calf recovered from that difficulty but never appeared thrifty until last spring. When she was turned out to pasture with five other heifers she was in good condition and looked as thrifty as any of them, and they were a very fine lot of heifers. The animals were visited often by our foreman and were seen by some of the men nearly every day. On October 18th, one of the stock men reported that this particular heifer was not looking well. She was taken up the same day and put in the barn remote from other animals. Dr. Russell's attention was called to her. He said there was trouble with her lungs but hoped it would only prove to be a case of pneumonia. After watching and caring for her for a few days, he had her removed to an out-building believing that she was afflicted with tuberculosis. Her place in the barn was thoroughly disinfected with corrosive sublimate by the doctor's orders.

On October 31st the farm committee were here and were informed of the state of the case. Dr. Russell advised the killing of the heifer which was ordered. Her lungs were found in bad condition and left no doubt as to the nature of the disease. Dr. Russell indicated that the dam (Sard 4th) of the heifer, was also in trouble.

The farm committee, acting according to law in regard to such matters, instructed me to notify the cattle commissioners, which I did by letter to Dr. Bailey on the same day. Dr. Bailey and Mr. F. O. Beal came here on the following Monday and examined only the dam of the heifer that had been killed. This cow was condemned and ordered in quarantine. No further examination of the herd was made at that time as Dr. Bailey was obliged to go to Augusta on the noon train. A week later they came again, killed Sard 4th (she was diseased,) ordered Velma 2d in quarantine for thirty days, because unable to decide her case with certainty at that time. Dr. Bailey advised watching the Holstein cow Nitalia closely. The remainder of the herd was pronounced sound.

Respectfully submitted,

WALTER BALENTINE.

Farm Inventory, December 1, 1890.

LIVE STOCK.		
HORSES.		
1	Percheron-Norman stallion (leased)	
1	Pair mares.....	\$350 00
2	Two year old colts	200 00
2	Weanling	100 00
CATTLE.		
1	Holstein cow.....	250 00
1	“ bull, two years old	100 00
2	Guernsey three year old cows	300 00
1	“ two year old heifer	100 00
2	“ yearling heifers	100 00
1	“ bull	100 00
1	“ bull calf	15 00
2	Jersey three year old cows	100 00
2	“ yearling heifers	50 00
3	“ heifer calves.....	45 00
1	“ bull	100 00
6	Grade cows	240 00
1	“ heifer calf	5 00
SHEEP.		
7	Ewes	70 00
SWINE.		
5	Sows.....	75 00
1	Boar	15 00
13	Shoats	91 00
26	Pigs	52 00
		2,458 00
PRODUCE.		
145	Tons of hay	1,450 00
17	“ barley not threshed	204 00
40	bush. peas.....	50 00
200	bush. turnips.....	50 00
		1,754 00
FARMING TOOLS AND IMPLEMENTS.		
VEHICLES.		
1	Farm wagon	50 00
1	“ with hay-rack	25 00
1	Hay-rack with wheels	25 00
1	Two-horse dump-cart.....	30 00
1	Single dump-cart with forward wheels.....	20 00
1	Light express wagon	40 00
1	Double-seated pung	25 00
1	Pung, old	5 00
1	Road cart	30 00
MACHINERY.		
1	Buckeye Mower	40 00
1	Bradley “ No. 6	40 00
1	Eureka “	40 00

Farm Inventory—Concluded.

1 Horse-rake	\$20 00
1 Eclipse corn planter.....	25 00
1 Mudgett hay tedder	25 00
2 Double harpoon hay forks, with carriers, ropes and pulleys,	20 00
4 Sward plows	40 00
1 Sub-soil plow	10 00
1 Fillibrown harrow.....	6 00
1 Randall "	10 00
1 Thomas smoothing harrow	15 00
1 Spring-tooth harrow.....	16 00
1 Potato digger	8 00
1 Kemp manure spreader.....	50 00
1 Winoowing machine.....	10 00
1 Queen of the Harvest seed separator.....	10 00
1 None such hay cutter.....	3 00
1 Peerless corn sheller	1 00
1 Planet, Jr., planter	3 00
1 Mathew seed drill	1 00
1 Planet, Jr., cultivator.....	5 00
1 Corn planter	10 00
1 Root cutter	5 00
1 Feed truck	3 00
7 Scythes with snathes	3 50
5 Drag rakes	1 00
8 Land rakes.....	75
3 Cant-dogs	3 00
1 Barrel lifter	50
1 Bush scythe and snath	1 00
1 Stone hoe.....	25
7 Hay forks.....	1 75
4 Manure forks.....	1 00
2 Iron rakes.....	1 00
4 Potato hooks.....	1 00
1 Hay knife.....	1 00
1 Spading fork	75
2 Barn hoes	50
2 Axes	1 00
2 Crow bars	2 00
1 Shuffle hoe.....	45
1 Steelyard	1 50
1 Platform scale	5 00
1 Bull staff.....	50
2 Feed baskets	1 00
2 Grindstones	3 00
1 40-gallon boiler	3 00
1 Harness	45 00
1 Harness	20 00
Dairy apparatus.....	100 00
Household furniture and furnishings.....	325 00
	1,190 45
Total	\$5,402 45

Department of Natural History.

President M. C. Fernald:

DEAR SIR—The following report of the Department of Natural History for the two years ending November 25, 1890, is respectfully submitted:

CLASS WORK.

Since my last report there have been but few changes in the routine of class work. Laboratory practice has been increased and since the requirements for admission were raised, a constant effort has been made to elevate the standard of scholarship. It is gratifying to notice the greater interest taken by students in Natural History since Coburn Hall was occupied and to note the greater thoroughness in work, due to better facilities for laboratory practice and illustration. More than ever before have the students shown a desire to exceed the requirements of the course and undertake original research. It is to be hoped that this spirit can be fostered and encouraged by fuller laboratory equipments and increased collections. It is a pleasure to state that most of the students who have taken Natural History studies have shown an interest in them and have made good use of the facilities afforded.

DEPARTMENT WORK.

The work of this department, for students, consists of recitations, laboratory practice and the examination of museum specimens. During the year instruction is given in Phœno-

gamic Botany, Cryptogamic Botany, Human Physiology, Invertebrate Zoology, Vertebrate Zoology, Entomology, Mineralogy and Geology, each one term, excepting Mineralogy and Geology which, together, occupy one term.

LABORATORY WORK.

Laboratory work in Phœnogamic Botany for the Freshmen has occupied about six hours a week in the afternoon for the last six weeks of the spring term, but it is hoped that the new scheme of studies will provide for ten hours per week. Sophomores in Cryptogamic Botany practice three afternoons each week and with the compound microscope study twenty-five type specimens covering the entire range of Cryptogams. Freshmen in Human Physiology have occasionally devoted an afternoon dissecting lower animals, examining the skeletons, models and charts, but it is hoped that arrangements can be made for regular work one afternoon each week. Senior laboratory work in Zoology and Entomology has been, so far, confined to recitation time, but it is of the utmost importance that arrangements be made for at least two afternoons practice in Invertebrate and Vertebrate Zoology and Entomology. The course in Mineralogy consists largely of laboratory practice, specific gravity work, examination of physical properties and blowpipe tests of the more common minerals of economic importance. Since my last report the Hatch Experiment Station has been established and the work of the station in Economic Botany and Entomology assigned to the Professor of Natural History of the College. Two reports have been made which will be found in the Station Annual Reports for 1888 and 1889. The classes in Human Physiology and Phœnogamic Botany were assigned to Mr. F. P. Briggs, Station Assistant in Botany and Entomology, who has taught them successfully besides rendering efficient aid in museum and herbarium work.

ORIGINAL WORK.

In order that a teacher be active and abreast with the scientific thought of the day, it is absolutely necessary that he be not so burdened with routine work as to have no time to read the current literature or too wearied to engage in original research. Nor can the highest order of work be done when the teacher has to give instruction in so many branches, that while teaching those of one-half the year he is unable to give any thought to those taught in the other half. That this has been the case in the Natural History Department will be apparent by reference to the long list of ologies mentioned above. It is to be hoped that the increase of funds will allow more specialized and therefore a higher order of work.

Original work has been done in the following directions :

(a) Investigations in Economic Botany and Entomology in pursuance of station duties.

(b) Examining and cataloguing museum and herbarium material on hand.

(c) Preparation of microscopic and other material for illustrating Natural History to classes.

(d) Collecting and classifying material found in the State for the herbarium and museum.

(e) Answering letters of inquiry on Natural History.

(f) Preparation of articles and lectures on scientific subjects.

MUSEUM AND HERBARIUM WORK.

Since my last report the Zoological specimens including vertebrates and invertebrates amounting to several hundred species have been classified and mostly catalogued.

The phænogams of the Blake herbarium, amounting to several thousand species have been carefully examined, catalogued and arranged in the herbarium case according to Bentham and Hooker's Genera Plantarum. The cryptogams

of the Blake herbarium have been arranged in larger groups preliminary to closer study. The numerous duplicates of flowering plants are now being arranged in family bundles preparatory to exchanging.

Besides the above, collections have been made in the vicinity and prepared, also the accessories donated by friends have been classified, preserved and catalogued. The most of the museum material is now in shape for class illustration. There is all the time more or less work in the collections caring for them. With the increase of funds it is hoped provision will be made for large additions to the collections which will demand more museum work for which arrangements should be made.

ACCESSIONS TO THE HERBARIUM.

Since my last report the Botanical Department has received the following important additions: The Blake herbarium, donated by Mr. J. G. Clark, Bangor, Me., consisting of many thousand indigenous and foreign phænogams and cryptogams, also a handsome and commodious case for the above collection, together with money enough to purchase internal equipments and to conduct exchanges.

The Ellis collection of N. A. Fungi, amounting to twenty-three hundred numbers, purchased jointly by the college and station; a collection of grasses and forage plants from the Department of Agriculture, Washington, D. C.; a collection of Maine plants donated by Merritt L. Fernald of the Freshman class; quite a large number of Maine phænogams and cryptogams collected by the department.

ACCESSIONS TO COLLECTIONS.

The collections have considerably increased during the last two years by donations from students and other friends of the college, and by purchase.

The appropriations made two years ago have been used to meet current expenses, procure needed appliances and purchase specimens.

We would respectfully solicit donations of natural history, mineral or geological specimens for the cabinets, assuring those who send *desirable* material, that it will be properly placed on exhibition, and full credit given in the register and on the labels.

To such as send a sufficient amount of material a special case or space will be assigned. The collections on hand are now properly registered, and every two years will be published a catalogue of the accessions, giving full credit to donors.

Below will be found the accessories to the zoological, mineralogical and lithological cabinets for the past two years.

ACCESSIONS TO ZOOLOGICAL DEPARTMENT.

MAMMALS.	Locality.	Donor or Collector.
Mink (<i>Putorius vison</i>)	Orono.	T. L. Merrill.
Gray Squirrel (<i>Sciurus carolinensis</i>)	Orono.	S. L. Crosby.
Meadow Mouse (<i>Arvicola pennsylvanica</i>)	Orono.	Bartle Harvey.
Klipdas (<i>Hyrax capensis</i>)	South Africa	Purchased.
Collared Peccary (<i>Dicotyles torquatus</i>)	Central America	Purchased.
Duck-billed Platypus (<i>Ornithorhynchus anatinus</i>)	Australia	Purchased.
Armadillo (<i>Tatusia paba</i>)	Central America	Purchased.
Wombat (<i>Phascolum ursinus</i>)	Australia	Purchased.
Silky-haired Ant-eater (<i>Echidna setosa</i>)	Australia	Purchased.
Opossum (<i>Didelphys virginiana</i>)	Virginia	Purchased.
Star-nosed Mole (<i>Condylura cristatus</i>)	Orono.	F. L. Harvey
Red Squirrel (<i>Sciurus hudsonicus</i>)	Orono.	R. H. Fernald.
Flying Squirrel (<i>Sciuropterus volans</i>)	Orono.	R. H. Fernald.
Brown Bat (<i>Vespertilio subulatus</i>)	Orono.	F. P. Briggs.
BIRDS.		
Turkey (<i>Meleagris gallopavo</i>)		Class of '88.
Barred Owl (<i>Syrnium nebulosum</i>)	Orono.	F. T. Dow.
Hooded Merganser (<i>Mergus cuculatus</i>)	Old Town	F. T. Dow.
Pine Grosbeak (<i>Pinicola ununcleator</i>)		R. H. Fernald.
White-winged Cross-bill (<i>Curvirostra leucoptera</i>)	Orono	R. H. Fernald.
Great Northern Shrike (<i>Collurio borealis</i>)	Scarboro	G. M. Pillsbury.
Buffle-headed Duck (<i>Bucephala albeola</i>)	Maine.	S. L. Crosby.
Solitary Tattler (<i>Totanus solitarius</i>)	Maine.	S. L. Crosby.
Barn Swallow (<i>Chelidon erythrogaster</i>)	Maine.	S. L. Crosby.
Merganser (<i>Merganser americana</i>)	Maine.	S. L. Crosby.
English Sparrow (<i>Passer domesticus</i>)	Maine.	S. L. Crosby.
A One-legged Duck (<i>Glaucionetta clangula</i>)	Maine.	S. L. Crosby.
Carolina Dove (<i>Zenaidura carolinensis</i>)	Rockland.	R. H. Blackington.
Golden-winged Woodpecker (<i>Colaptes auratus</i>)	Maine.	S. L. Crosby.
Short-eared Owl (<i>Brachyotus palustris</i>)	Maine.	S. L. Crosby.
Long-tailed Duck (<i>Harelda glacialis</i>)	Maine	S. L. Crosby.
Herring Gull (<i>Larus argentatus</i>)	Maine.	

Goldfinch (<i>Chrysomitris tristis</i>).....	Maine.....	
Pine Grosbeak (<i>Pinicola enucleata</i>).....	Maine.....	
Goshawk (<i>Astur atricapillus</i>).....	Maine.....	Purchased.
Rusty Grackle (<i>Solecophagus ferrugineus</i>).....	Maine.....	G. H. Steward
Black-billed Cuckoo (<i>Coccyzus erythrophthalmus</i>).....	Maine.....	J. A. Lord.
Pileated Woodpecker (<i>Hylotomus pileatus</i>).....	Maine.....	W. J. Hancock.
REPTILES.		
Eggs of Musk Turtle (<i>Aromochelys odoratus</i>).....	Warren, Mass.....	E. F. Hitchings.
Eggs of Painted Turtle (<i>Chrysemys picta</i>).....	Warren, Mass.....	E. F. Hitchings.
Eggs of Snapping Turtle (<i>Chelydra serpentina</i>).....	Warren, Mass.....	E. F. Hitchings.
Box Turtle (<i>Cistudo carolina</i>).....	District of Columbia.....	L. H. Merrill.
Musk Turtle (<i>Aromochelys oceloratus</i>).....	Virginia.....	L. H. Merrill.
Snapping Turtle (<i>Chelydra serpentina</i>).....	Maine.....	F. P. Briggs.
Horned Toad (<i>Phrynosoma</i>).....	California.....	C. A. Mason.
BATRACHIANS.		
Red Ewet (<i>Diemyctylus miniatus</i>).....	Hampden.....	E. L. Morey.
Newt (<i>Diemyctylus virescens</i>).....	Orono.....	W. J. Hancock.
Jeffersen's Salamander (<i>Amblystoma jeffersonianum</i>).....	Orono.....	F. L. Harvey.
Spotted Salamander (<i>Amblystoma punctatum</i>).....	Orono.....	F. L. Harvey.
Salamander (<i>Plethodon erythronotus</i>).....	Orono.....	F. L. Harvey.
FISHES.		
Miller's Thumb (<i>Cottus gracilis</i>).....	Auburn.....	L. H. Merrill.
Chub (<i>Semotilus bullaris</i>).....	Orono.....	R. H. Fernald.
Eggs of Salmon (<i>Salmo salar</i>).....	Penobscot river.....	E. F. Hitchings.
MARSOPOBRANCHS.		
Lamprey (<i>Petromyzon marinus</i>).....	Stillwater river.....	Fred Grant.
CRUSTACEANS.		
Crayfish.....	Maryland.....	E. R. Haggett.
MOLLUSKS.		
Fresh water Shells (6 species).....	Montana.....	G. P. Merrill
Sea Shells (4 species).....	West Indies.....	H. A. Pillsbury.
WORMS.		
Hair Worm (<i>Gordius aquaticus</i>).....	Thomaston.....	W. W. Lermont.

MINERALS.

Name.	Locality.	Donor.
Garnets.....	Topsham, Maine.....	A. E. Rogers
Muscovite.....	" ".....	" "
Greasy Quartz.....	" ".....	" "
Magnetite.....	" ".....	" "
Orthoclase.....	" ".....	" "
Tourmaline.....	Brunswick, ".....	" "
Margarite.....	Chester, Mass.....	E. F. Hitchings.
Flexible Sandstone.....	Sauratown Mts., N. C.....	U. S. Nat. Museum.
Wood silicified by Geysers.....	National Park, Wyo.....	" "
Chalcedony after Coral.....	Tampa, Fla.....	" "
Geyserites.....	Nat. Park, Wyoming.....	" "
Silicious Sinter.....	" ".....	" "
Serpentine after Diopside.....	Montville, N. J.....	" "
Silicified Wood.....	National Park, Wyo.....	" "
Geode.....	Keokuk, Ia.....	" "
Kyanite.....	Buncombe Co., N. C.....	" "
Williamsite.....	Fulton, Pa.....	" "
Lepidolite.....	Auburn, Me.....	" "
Rodochrosite.....	Butte, Mont.....	" "
Deweylite.....	Webster, N. C.....	" "
Graphite.....	Ceylon.....	" "
Gaylussite.....	Ragtown, Nev.....	" "
Agalmatolite.....	Mexico.....	" "
Anabaster.....	" ".....	" "
Travestine.....	Egypt.....	" "
Serpentine.....	Montville, N. J.....	" "
Halite.....	Lincoln County, Nev.....	" "
Dolomite.....	Pleasantville, N. Y.....	" "
Zinc Blende.....	Madison, N. H.....	" "
Jaspery Hematite.....	Marquette, Mich.....	" "
Vermiculite.....	Easton, Pa.....	" "
Magnesite.....	Fultown, Pa.....	" "
Limonite.....	Saxony.....	" "
Stalactite.....	Brener County, Ia.....	" "
Calcite.....	Rockland, Me.....	" "
Graphite.....	Port Henry, N. Y.....	" "
Nickle Ore.....	Webster, N. C.....	" "
Argentiferous Galena.....	Rimini, Montana.....	E. O. Goodridge.
Zinc Blende.....	Helena, ".....	" "
Gold and Silver Ore.....	Marysville, ".....	" "
Hornblende.....	Helena, ".....	" "
Bornite.....	Butte, ".....	" "
Talc.....	Helena, ".....	" "
Copper.....	Butte, ".....	" "
Chalcedony.....	Unknown.....	J. E. Dike.
Chialstolite (Drift).....	Orono, Me.....	W. R. Farrington.
Chialstolite.....	Maine.....	J. H. Burleigh.
Muscovite.....	Unity, Me.....	Harry Butler.
Asbestos.....	Lake Champlain, N. Y.....	A. H. White.
Magnetite.....	" ".....	" "
Petroleum.....	Alleghany Co., N. Y.....	A. C. Hardison
Pyrite.....	Newfoundland.....	N. E. Wilson
Chalcopyrite.....	Cableton, Canada.....	" "
Argentiferous Galena.....	Cherryfield, Maine.....	F. P. Briggs.
Chalcopyrite.....	Gouldsboro', ".....	William Freeman.
Molybdenite.....	Maine.....	" "

ROCKS.

Name.	Locality.	Donor.
Steatite	Warren, Maine	H. V. Starrett.
Limestone	"	"
Calico Marble	Burlington, Vt.	L. H. Merrill.
Red Granite	Calais, Me	"
Sandstone	Robbinston, Me	"
Pierite	Little Deer Isle, Maine,	"
Diabase	Rockland, "	"
Serpentine	Deer Isle, "	"
Melaphyr.	Eastport, "	"
Calcareous Tufa	Hot Spring, Ark.	E. F. Hitchings
Flint nodule	England	U. S. Nat. Museum.
Basaltic Lava	Butte, Utah	"
Limestone	Smithfield, R. I.	"
Norite	Keesville, N. Y.	"
Orbicular Granite	Craftsbury, Vt.	"
Pegmalite	Auburn, Me.	"
Chromic Iron	Macon County, N. C.	"
Guano	Martin Islands	"
Petrified Wood	National Park, Wyo.	"
Calc Tufa	Oneida County, Idaho	"
Calc Sinter	National Park, Wyo.	"
Diopside	Montville, N. J.	"
Calcite and Asbestos	Easton, Pennsylvania	"
Chrysotile	"	"
Dunite	Macon County, N. C.	"
Nephrite	New Zealand	"
Magnetic Ore	Essex County, N. Y.	"
Saxenite	Webster, N. C.	"
Petrified Wood	Basin, Montana	E. O. Goodridge.
Granite	"	"
Granular Quartz	Helena, "	"
Pumice	Straits of Sunda	A. B. Aubert.
Clay	Augusta, Me	F. L. Harvey.
Labradorite	Keeseville, N. Y.	G. H. Steward.
Olivine Diabase	Mt. Cutler, Maine	F. C. Moulton.
Mica Diorite	Clifton, "	F. P. Briggs.
Concretions	Brunswick, "	W. H. Atkinson.
Porphyry	Orono, "	A. E. Rogers.
Concretion	New Brunswick	G. B. Fernald.
Diatomaceous Earth	Blue Hill, Me.	F. L. Harvey.
Conglomerate	Orange County, N. Y.	A. W. Drew.
Clay with Concretions	Orono, Maine	Walter Flint.
Concretion	"	A. J. Coffin.
Thirty-eight specimens of Fossils.	Iowa	A. E. Rogers.
Fire-brick Clay	Fort Payne, Alabama	J. W. Spaulding.
Hematite	"	"
Limonite	"	"
Kaolin	"	"
Bituminous Coal	"	"

INCREASED FACILITIES.

The material named above has added much to the facilities for illustration. There have also been added several pieces of apparatus for laboratory use and the additions to the college library and the station library have helped the department very much. There has been ordered for illustrating the perishable forms of invertebrates a large collection of models which will probably be here and available next term and add very much to the interest of Zoology.

NEEDS OF THE DEPARTMENT.

More storage room will be needed if the contemplated additions to the museum are made. The museum was not fully provided with cases and drawers when constructed. Additional cases, stacks of drawers, more shelves in the cases on hand and some small cases for chemicals and apparatus in the laboratories will be needed.

MICROSCOPES.

There should be enough compound microscopes so that each student doing laboratory work can have the full use of an instrument during his entire course. This would be a great saving of laboratory time, as students are now compelled to wait for instruments, also if assigned instruments they would often do work at their rooms out of laboratory hours, and thus get a better knowledge of the subject taught.

MUSEUM.

A general museum is a great attraction to visitors and also a constant educator of students during their course at college. A good museum frequented by students for four years is almost equal to a liberal course in Natural History. Students have a right to expect that specimens, to properly illustrate the studies taught, will be provided.

Since the collections were arranged in the cases the museum has been much frequented by students and visitors. It is hoped that it can be made a greater attraction and source of instruction by adding a complete set of the mammals and birds of Maine, and such exotic type specimens as will serve to illustrate the Natural Sciences taught.

It will take a long time to complete a collection of Maine animals and the work should begin at once.

MODELS, CHARTS, ETC.

Zoology cannot be properly taught without models, charts and skeletons, and a manikin is needed for Physiology, and models and charts for Zoology. Geology can not be made interesting without maps, models, charts, casts and fossils, and provision should be made for them.

Below we give estimates of the amount needed at present to begin the work.

ESTIMATES.

For cases, drawers, shelves, etc., for museum.....	\$600 00
For six microscopes and accessories.....	300 00
For a manikin.....	750 00
For increasing the collections and obtaining other appliances for laboratories and museum.....	1,000 00
	<hr/>
	\$2,650 00

Respectfully submitted,

FRANCIS L. HARVEY.

Department of Chemistry.

President M. C. Fernald :

Since writing my last report but few changes have been made in my department. The number of recitation hours has been the same as heretofore. During the forenoons of the spring term, one hour was devoted to advanced chemistry and two to qualitative analysis. During the fall term I held one recitation in general chemistry, one in advanced organic chemistry and one in advanced inorganic chemistry, the afternoons of both terms being devoted to work in the laboratory for Juniors, Seniors and a part of the Sophomore class.

I have used Fischer's Text Book of Elementary Chemistry during the past two years with the Sophomore class, in place of the one formerly in use. It has proved a very satisfactory work, on the whole, and with Hart's Exercises in Chemistry for laboratory practice, has given a good drill in the elements of the science.

It would be of advantage to the students, if the whole class, instead of a part only, were to take these practical exercises in chemistry. By dividing an ordinary class into two sections, and with some assistance, the work could be successfully carried out.

The old Experiment Station room, into which the Juniors and Seniors have been moved, though small, proves an excellent quantitative laboratory.

At the Commencement in June, 1889, the following students received the degree of Bachelor of Science :

Jeremiah Sweetser Ferguson, presenting a thesis on "Water Analysis."

George M. Gay, presenting a thesis on "The Determination of Antimony in Tartar Emetic and the complete analysis of an alloy of Antimony, Zinc and Lead."

Mortimer F. Wilson, presenting a thesis on "Milk and Butter," and their analysis.

At the Commencement in June, 1890, the following students took the degree of Bachelor of Science:

Ralph H. Blackington, presenting a thesis on "Dolomite as a Limestone" with analyses.

Alphonso J. Coffin, presenting a thesis on "The Analysis of Potable Waters."

Edmund N. Morrill, presenting a thesis on "The Manufacture of Paint from Low Grade Lead and Zinc Ores."

Frank W. Sawyer, presenting a thesis on "Chemical Fibre, with special reference to the soda process."

Charles S. Williams, presenting a thesis on "The Determination of Sulphur, Phosphorus, Silicon and Carbon in Iron."

George F. Lull, B. S., received the degree of Master of Science, presenting a thesis on "Evaporation as applied to the concentration of the soda liquor of pulp mills."

Since the destruction of Wingate Hall, by fire, the want of room has greatly been felt in the laboratory, as the department of Civil Engineering has been obliged to seek quarters in the building also. I have been compelled to use a small private laboratory as a recitation room, for which it is not at all adapted, giving hardly any blackboard room and being otherwise ill-fitted for such a purpose.

I trust that the necessary sum of money will be appropriated by the State for the erection of a suitable building for the other departments, so that work in this department may be carried on in a satisfactory manner. The sums heretofore appropriated to this department have been rather small, so that the quantity of costly special apparatus is small and even that of general apparatus and glassware is not more than sufficient for its present needs.

The money to be allowed to this department from the national appropriation will be most welcome and it will put

us on a proper footing to do excellent work in the future. In order to thoroughly utilize these additional resources there will be need of a competent assistant, so that the course in Chemistry may be more fully developed and the work done of the greatest advantage and value to the students.

Respectfully submitted,

A. B. AUBERT,

Professor of Chemistry.

Below will be found the data in regard to the use of money appropriated for 1889 and 1890.

Sum appropriated.....		\$253 75
Apparatus and chemicals.....	\$236 13	
New sinks for quantitative laboratory..	7 00	
Freight and cartage.....	5 59	
To balance.....	5 03	
	<hr/>	<hr/>
	\$253 75	\$253 75

Department of Civil Engineering.

President M. C. Fernald:

The following report concerning the Department of Civil Engineering is respectfully submitted.

The work assigned to this department is shown by explanatory and tabular statements in the catalogue.

This work has been accomplished in a satisfactory manner by the classes pursuing the course, and especially during the first year, as we have been able to do somewhat more in the line of field practice and designing than at any time in the past. So I think I can safely say that the work done in this department, except so far as it has been cramped and disarranged on account of the burning of Wingate Hall, which drove us into very small quarters, and in many other ways interfered with the successful working of the department, has been more and better adapted to the practical wants of the great majority of the students who take it than at any time heretofore.

At the last session of the legislature an appropriation of one hundred and forty-five dollars was made for this department to be expended in procuring general apparatus, and with it have been procured a railroad compass, an ordinary surveyor's compass, several measuring tapes, some drawings and some other small pieces of much needed apparatus; and a portion of the appropriation has also been expended in the purchase of special technical books of reference for the use of students in the course. Such books are an absolute necessity in carrying on our work and are too expensive to require the students to purchase for themselves.

In the revised statutes of Maine there is a provision by which the County Commissioners for Penobscot county are allowed to establish and maintain a true meridian line upon the grounds belonging to the State College. At my request the commissioners have established such a meridian line and I find it of great value to me in teaching the boys surveying.

Many improvements in methods and changes in the work done, are yet needed in the course in civil engineering, but we have been prevented from making them in the past on account of a lack of means and accommodations.

Now, however, that more ample means are at the disposal of the trustees, it is to be hoped that some of these wants will be supplied. One of our wants, which has long been felt and often brought to your attention in the past, is a new building in which the departments of civil and mechanical engineering may have suitable quarters. In the past our quarters have been small, and very poorly adapted to the demands of our work, but now new difficulties have arisen in this direction. By the burning of Wingate Hall the entire work of the department has been crowded into one small recitation room. Under such circumstances it is impossible to do any kind of work satisfactorily, and I hope you will impress upon the trustees the importance of providing a new and suitable building for the use of this department at once.

Much of my time and attention during the past few years has been devoted to the construction and planning of the water supply and drainage system, and superintendence of the construction of the new buildings.

In this connection I will state, what to me seem to be some of the wants of the institution in this particular direction. All the principal buildings on the grounds are now connected with the main sewer leading to the river. The dwelling houses and farm buildings alone remain to be connected. These should be suitably connected with the river at once, in order that no part of the grounds shall become contaminated with the drainage from any of the buildings.

At the last session of the legislature an appropriation of \$3,000 was made for the construction of a system of water works. With this money and other sums from the funds of the Experiment Station and other sources, such a system has been constructed and it meets the wants of the institution in every way except as to protection from fire. A constant fire pressure can be maintained only by keeping up steam in the boiler all the time, while to pump this water, steam is required only twice or three times a week.

To keep up steam constantly, of course, is expensive, yet if no other way is provided, with so much valuable property exposed, it would seem a wise precaution to keep up steam all the time at whatever cost. To complete the system and give us one that can be worked economically it will be necessary to add a stand-pipe of sufficient height and capacity to give fire pressure at all times and only require the use of the pump once or twice a week. A stand-pipe 120 feet high of ten feet diameter would meet these requirements and besides giving completeness to the system it would be of great use to both departments of engineering for experimental work in the study of hydraulics.

The construction of our system of water distribution has necessarily been quite expensive on account of the large area over which the water has to be distributed. The buildings are scattered over a large tract of land as will be seen by reference to the plan of the grounds in this report. The pipe system is composed of 1884 feet of six-inch pipe, 800 feet of four-inch pipe, 300 feet of two-inch pipe, 1600 feet of one and one-half-inch pipe, 1868 feet of one-inch pipe, 2300 feet of one-half-inch pipe and 450 feet of three-fourths-inch pipe.

As the care of the grounds about the buildings has been somewhat left to me in the past, I would respectfully call attention to their present condition, and urge the importance of making a radical change in it as soon as possible. The natural beauties of our grounds are many, and very suscepti-

ble of artificial improvement. By constantly working in the right direction, and according to some well-considered plan, made by a competent landscape gardener, a moderate expenditure of money on the grounds each year for a few years to come, will enable us to change them to a beautiful park, which would, at the same time, attract and instruct.

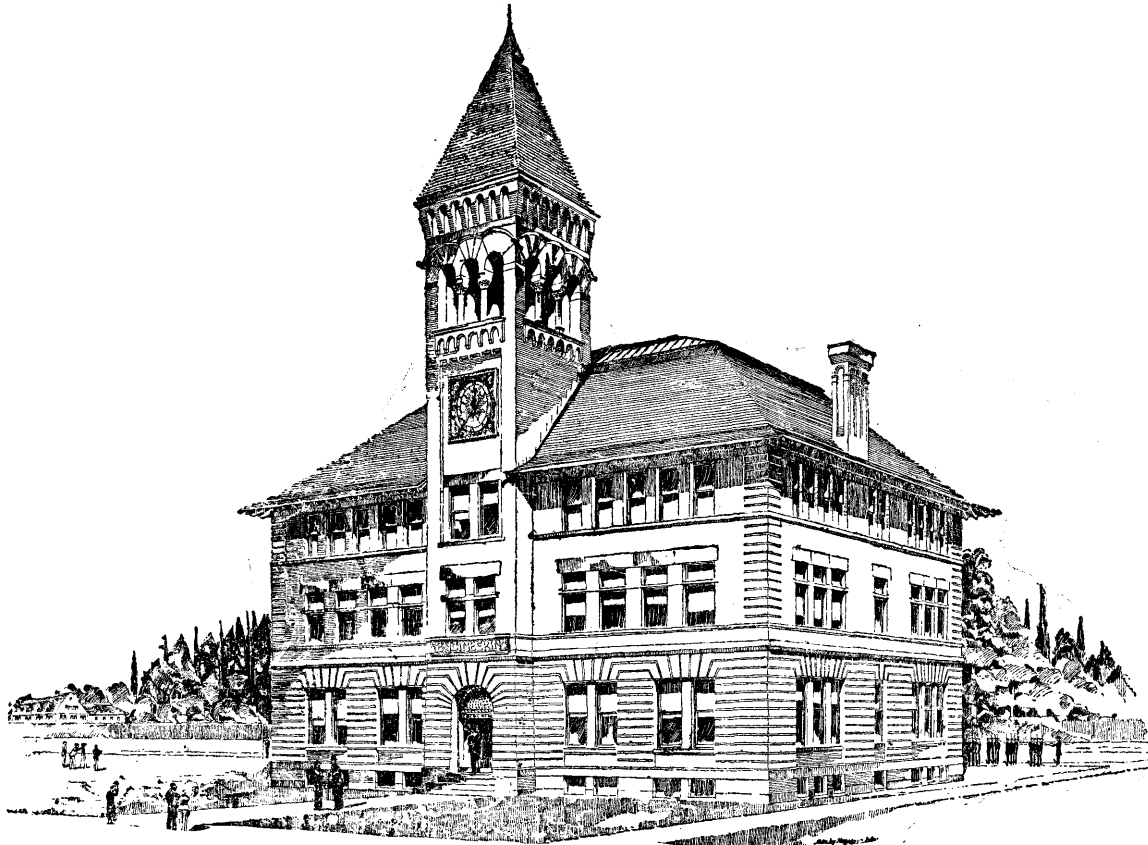
There are, I think, considerations of sufficient importance, even from a money stand-point, to induce the State to invest a small amount in this work, especially as these extensive grounds have been wholly given to the State.

There is no other way in which the farmers of this State could add so much to the value of their farms with the expenditure of so little money, as in the general clearing up and beautifying of their grounds. Why this is not done is not so much on account of the expense, because it could be done in such a way and at such times as to cost absolutely nothing, but because of the lack of a properly developed taste. Now there is no way to develop such a taste better than by association, and hence the grounds connected with an institution which is constantly educating so many of Maine's future citizens, and it is hoped farmers, should teach each and every one of its pupils a valuable lesson in this respect, by association during their stay at the college.

G. H. HAMLIN,

Professor of Civil Engineering.





DESIGN FOR ENGINEERING BUILDING.

Mechanical Engineering.

President Fernald:

The routine work of this department has not been changed during the past two years. The quality of the work done by the classes both in the recitation-room and drawing-room has been highly satisfactory. It is gratifying to be able to state that the students find ready employment after graduating and many of them get their situations before graduating.

The improvements made are mostly in the line of shop-work and equipment. At the last session of the legislature \$5,000 were appropriated for additional machinery. Of this amount \$4,000 was to be spent in purchasing lathes and planers for iron work. The remaining \$1,000 was to be used in equipping the foundry. With a part of the sum first named, the following tools have been bought, together with shafting, belting, pulleys and attachments for putting them in running order: Two 14-inch Blaisdell lathes, one 14-inch Flather lathe with Taper attachment, power cross feed and turret head, a 15-inch Hendey shaper, a 20-inch Prentice drill, a Slate's sensitive drill with centering attachment, a No. 5 Diamond grinder with saw gumming attachment, a 40-inch grindstone with iron frame, a No. 14 Brainard milling machine with a set of arbors, cutters, &c. There are several other tools ordered but they have not yet been received. The money is not all used yet but the available space is all occupied.

Owing to the increase in the number of students it became necessary to enlarge the forge shop, by occupying the room that was designed for a foundry. This makes it impossible

to use the \$1,000 appropriated to equip a foundry until a building is provided. Since such a building is very likely to take fire, an inexpensive structure placed at a little distance from the shop would answer every purpose until a larger shop is built. I would recommend that \$800 be appropriated to construct a foundry building and to make connection with the power.

We are now obliged to have drawing and machine work going on at the same time in the same room. While this does not interfere with the machine work at all, those at work drafting complain of the vibration of the building and of the dirt, which necessarily accompanies this class of work. The new building which has been designed to occupy the space left by the burning of Wingate Hall, will supply the much needed space for drafting and recitation rooms. Recitations have to be carried on while the shop work is in progress and at times it has been necessary to omit the exercises on account of the noise. This new building is needed very much in order to maintain the efficiency of the work.

Although no course in machine work has been laid out, some members of the senior class have devoted a large amount of time to the construction of parts of machines. One member has made the patterns for a small boat engine, and is now at work finishing the castings. The casting had to be done in Bangor. Another has made patterns for an eight light dynamo and has nearly completed the machine work. Considering the circumstances they have done remarkably well and have shown great interest in their work.

A regular course in machine work will be established next term. The Russian system which has always been used will not be retained entirely, because it has been demonstrated conclusively that students take more interest in working on some piece of machinery than in an elementary lesson. A few elementary lessons will be given to start with, but actual work will be given them as soon as possible.

In the early part of October the senior class was allowed leave of absence for one week to visit the Mechanics' Fair and

other places of mechanical interest at Boston. The trip was a profitable one and I would suggest that a certain amount of time each year be devoted to visiting well equipped manufacturing establishments, for it is the only way the students can get a very necessary element of their education. It is in this way they can see the practical illustration of the theories they have been taught. Our institution is situated so far from these establishments that the expense of travelling prevents many from visiting them. I would suggest that the college bear a part of this expense.

To equip the shop for pattern making more machinery is needed. A buzz planer, band saw and a table saw, together with the various hand tools used in such work should be provided. The students take great interest in pattern making and that together with moulding should be taught.

Once more I wish to ask that the shop be heated by steam. The wood stoves now used are not only an element of danger from fire but are very much in our way. By utilizing the exhaust steam from the engine the extra cost of heating in this way would be comparatively small.

Numerous photographs of machinery and drawings have been received from members of the alumni and others. A No. 20 Hancock Inspirator, cut so as to show the working of the machine, has been presented by the manufacturers. The department appreciates gifts of this kind and wishes to express its thanks to those who have favored it in the past.

Respectfully submitted,

WALTER FLINT.

Shop Work.

President M. C. Fernald:

During the past two years the number of students working in the shop has averaged eleven men from each class. This is about the same number as during the preceding two years. This number has been well accommodated except in the carpenter shop where we need more room. The work done has been fully up to the average in quality and quantity.

There have been some changes made in the building. We have taken out a partition and re-arranged the forges in the forge shop at a cost of \$50.00, have taken out a partition and sheathed the vise shop at a cost of \$60.00, also have put in two windows in the north side of shop. These changes give us much better light and better accommodations for working in every way.

The additions to the equipment have been four new forges with anvils, tools and the necessary piping, costing \$150.00, and the iron working machinery upon which Prof. Flint reports.

We now have a forge shop well arranged for working twelve students at a time and a vise shop in which we can accommodate sixteen men when the drawing tables are removed. In the carpenter shop we need the entire space on the second floor of the main building to accommodate the classes in carpentry and provide space for a few pieces of wood-working machinery.

Next term I should like to put in a small steam pump and an injector for the boiler, for the purpose of familiarizing the students with the care of such apparatus.

Yours respectfully,

H. S. WEBB.

Report of Military Department.

To President M. C. Fernald:

I have the honor to submit the following report of the progress and condition of the Military Department during the past college year.

Early in the college year, the authorities were in receipt of General Orders from the War Department, which prescribe that all colleges having the services of an army officer, must have a course of military instruction both practical and theoretical; and such course "shall be so arranged as to occupy at least one hour per week for theoretical instruction, and at least two hours per week for practical instruction." This order was accompanied by a circular, requesting all colleges which acquiesced in these conditions to notify the department to that effect. These conditions were cheerfully and promptly accepted by vote of the faculty, and notification furnished accordingly. In fact, during my connection with the college, the amount of time given to military instruction, both practical and theoretical, has exceeded the standard prescribed by the authorities at Washington.

WORK OF THE DEPARTMENT IN DETAIL.

Commencing with the spring term of the past college year, for a period of twelve weeks, the Senior class received instruction in general military science by a course of lectures, the Junior class received instruction by recitations in Upton's Tactics and the Sophomore class also received instruction by recitations in the same subject one lecture or recitation

being held per week for each of these three classes. The Freshmen class received practical instruction in the school of the soldier, setting up drill—three drills being held per week. For the remainder of the spring term, until commencement, all four classes received instruction, three hours per week in the schools of the company and battalion, including skirmish drill. During the fall term, the work of the department was entirely practical. From the commencement of the term until the first of October, all four classes received instruction three hours per week in the schools of the company and battalion, varied by the exercises of guard mounting and dress parade. During the month of October, and the first part of November, in suitable weather, instruction was given to all four classes in target practice.

OBSERVATIONS.

The Senior class were attentive to the lectures on Military Science, and interested in the different subjects considered. The recitations of both Junior and Sophomore classes were entirely satisfactory. The result of the work of target practice was to produce a great improvement in the marksmanship of the corps. There is a large number of excellent marksmen in the battalion, although a great majority of the students have had little experience in handling a rifle before coming to the college.

CHANGES.

The only change in the organization of the Battalion of Cadets, during the year was the substitution of a drum corps, of three drums and three fifes, for the band previously organized. The result of this change was to increase the size of the two companies by releasing about ten men previously assigned to the band.

ENCAMPMENT.

The battalion was encamped at the Eastern State Fair at Bangor, during Fair week, from September 2d to September 5th, inclusive. During this period, the regular routine of

camp life was observed ; and the time was profitably employed in perfecting the students in the military duties of a soldier's life. I have to acknowledge, in this connection, our indebtedness to Gen. H. M. Sprague, Adjutant General of Maine, for the loan of the necessary camp equipage. These encampments afford opportunity for imparting valuable military instruction ; and give, moreover, a pleasant relaxation from study for the students of the institution.

EXHIBITION DRILL.

At the close of the fall term, a selected company under the command of Capt. Wallace R. Farrington, gave a drill in connection with a military ball at Bangor, which was an excellent exhibition of perfection in company tactics.

RECOMMENDATIONS.

I would respectfully recommend that in making up the schedule of study incident to changes and additions in the different departments, provision be made for twelve lectures before the Senior class, and twelve recitations each for the Junior and Sophomore classes to be held during the first part of the spring term. If the hour and day were fixed permanently for this work, it would, in my opinion, be more satisfactory to all concerned, than the present method of changing the hour each week and alternating with some other study. Our target range needs an embankment in rear of the targets to catch the bullets and thus make the range entirely safe. The United States government now furnishes sufficient ammunition for this valuable military exercise. It will cost \$200 to build such an embankment, and I recommend that the legislature be asked to appropriate that sum for the purpose indicated.

ADDITIONAL DUTIES.

In addition to my regular military duties, I have performed the duties of instructor in Calculus during the entire college year.

CONCLUSION.

In conclusion, I wish to express my entire satisfaction with the manner in which the cadet officers have performed their respective duties during the year. This is especially due to Major Edmund Clark who has given valuable assistance at target practice, and to the two Captains, Wallace R. Farrington and Edwin R. Merrill, who have labored faithfully to bring their companies up to their present standard of excellence. I desire further to express my gratitude to the faculty for kind assistance and support in my work, an assistance which has greatly lightened my duties and made them at all times agreeable. And finally, I desire to express my satisfaction with the general condition and prospects of the military department.

Very respectfully,

Your obedient servant,

E. E. HATCH,

1st Lieut. 18th U. S. Infantry.

Prof. Mil. Science and Tactics.

TREASURER'S REPORT.

*To the Trustees of the Maine State College of Agriculture
and the Mechanic Arts:*

Maine State College in account with GEO. H. HAMLIN, Treasurer.

RECEIPTS

Balance on Jan 1st received from J. Fred Webster, Treas'r.	\$ 25 91
State appropriation	10,000 00
Insurance of Wingate Hall	10,095 00
United States government for Experiment Station	18 749 75
Term bills of students	9,176 79
Old term bills	1,611 77
Interest on Coburn fund	4,000 00
" Land Grant fund	5,915 00
" Lombard bonds	180 00
" City of Bangor bonds	180 00
" Security Loan and Trust Company bonds	180 00
" Rent	75 00
W. H. Jordan, director	330 80
M. C. Fernald, balance due on various accounts	101 36
Diplomas for second degree	20 00
Coal	64 77
For use of engineering instruments	2 50
Old lead	14 19
Experiment Station, for construction of water works	1,046 50
	\$61,769 34

DISBURSEMENTS

Bangor Savings Bank	\$5,000 00
Penobscot Savings Bank	5,000 00
Salaries	13,594 56
Experiment Station	15,067 11
Boarding house	6,771 69
Machinery for shop	2,735 77
Fuel	1,644 64
Construction of mineralogical laboratory	852 12
M. C. Fernald, for apparatus for departments	900 00
M. C. Fernald, for library and cases	350 00
Construction of green house	1,452 76
General expenses	270 65
Repairs on chemical laboratory	178 90
Incidental expenses	447 04
Farm live stock	129 00
General repairs	97 75
Repairs on Q. T. V. Club House	26 22
Water supply	181 17
Reading room	57 75
Diplomas for graduating class	66 70
Foundation of Wingate Hall	13 25
Completion of farm foreman and janitor's houses	75 58
Trustee expenses	196 02
Department of civil engineering	92 10
Improvement of grounds	4 50
Interest and discount of term bills	22 85
Clearing up after the burning of Wingate Hall	171 60

DISBURSEMENTS—CONCLUDED.

General shop expenses.....	\$154 42	
Repairs on steam heating apparatus of laboratory.....	452 29	
Construction of water works.....	2,793 04	
Balance on hand.....		\$58,799 48
		2,969 86
		\$61,769 34

CONDITION OF ENDOWMENT FUND.

Coburn bequest.....	\$100,000 00	
Invested in State of Maine 5% bonds.....	118,300 00	
" City of Bangor 6% bonds.....	3,000 00	
" Lombard Investment Company 6% bonds.....	3,000 00	
" Security Loan and Trust Company 6% bonds.....	3,000 00	
* " Hallowell C. and S. Academy 6% bonds.....	4,000 00	\$231,300 00

* Suspended payment of interest.

GEO. H. HAMLIN, *Treasurer.*

BANGOR, December 5, 1890.

This is to certify that I have examined the above accounts and find them properly vouched and correctly cast.

WM. H. STRICKLAND, *Auditor.*

STATEMENT OF BILLS RECEIVABLE AND BILLS PAYABLE.

BILLS RECEIVABLE.

Due from students.....	\$4,645 30
" on coal sold to professors, and sundry small bills.....	94 05
" " paid for and now on hand.....	1,000 00
	5,739 35
Balance on hand in Orono National Bank.....	2,969 86
	\$8,709 21

BILLS PAYABLE.

Due on green house.....	\$547 24
" A. F. Lewis.....	140 20
" R. S. Morrison.....	190 86
" Martin's express.....	88 10
" College farm.....	131 45
" Bangor Steam Laundry.....	108 55
" sundry small bills.....	107 66
" Leighton, Davenport & Co.....	386 00
	1,700 06
Balance.....	7,009 15
	\$8,709 21

Of this balance, \$3,682.64 belongs to the Experiment Station; \$2,264.23 is an unexpended balance from the State appropriation for machinery for the shop, leaving balance in favor of the College of \$1,062.34.

G. H. HAMLIN, *Treasurer.*

ACT OF CONGRESS, 1890.

An Act to apply a portion of the proceeds of the public lands to the more complete endowment and support of the colleges for the benefit of agriculture and the mechanic arts established under the provisions of an act of Congress approved July second, eighteen hundred and sixty-two.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled.

That there shall be, and hereby is, annually appropriated, out of any money in the Treasury not otherwise appropriated, arising from the sales of public lands, to be paid as hereinafter provided, to each state and territory for the more complete endowment and maintenance of colleges for the benefit of agriculture and the mechanic arts now established, or which may be hereafter established, in accordance with an act of Congress approved July second, eighteen hundred and sixty-two, the sum of fifteen thousand dollars for the year ending June thirtieth, eighteen hundred and ninety, and an annual increase of the amount of such appropriation thereafter for ten years by an additional sum of one thousand dollars over the preceding year, and the annual amount to be paid thereafter to each state and territory shall be twenty-five thousand dollars to be applied only 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: *Provided*, That no money shall be paid out under this act to any state or territory for the support and maintenance of a college where a distinction of race or color is made in the admission of students, but the establishment and maintenance of such colleges separately for white and colored students shall be held to be a compliance with the provisions of this act if the funds received in such state or territory be equitably divided as hereinafter set forth: *Provided*, That in any state in which there has been one college established in pursuance of the act of July second, eighteen hundred and sixty-two, and also in which an educational institution of like character has been established, or may be hereafter established, and is now aided by such

state from its own revenue, for the education of colored students in agriculture and the mechanic arts, however named or styled, or whether or not it has received money heretofore under the act to which this act is an amendment, the legislature of such state may propose and report to the Secretary of the Interior a just and equitable division of the fund to be received under this act between one college for white students and one institution for colored students established as aforesaid, which shall be divided into two parts and paid accordingly, and thereupon such institution for colored students shall be entitled to the benefits of this act and subject to its provisions, as much as it would have been if it had been included under the act of eighteen hundred and sixty-two, and the fulfillment of the foregoing provisions shall be taken as a compliance with the provision in reference to separate colleges for white and colored students.

SECT. 2. That the sums hereby appropriated to the states and territories for the further endowment and support of colleges shall be annually paid on or before the thirty-first day of July of each year, by the Secretary of the Treasury, upon the warrant of the Secretary of the Interior, out of the Treasury of the United States, to the state or territorial treasurer, or to such officer as shall be designated by the laws of such state or territory to receive the same, who shall, upon the order of the trustees of the college, or the institution for colored students, immediately pay over said sums to the treasurers of the respective colleges or other institutions entitled to receive the same, and such treasurers shall be required to report to the Secretary of Agriculture and to the Secretary of the Interior, on or before the first day of September of each year, a detailed statement of the amount so received and of its disbursement. The grants of moneys authorized by this act are made subject to the legislative assent of the several states and territories to the purpose of said grants: *Provided*, That payments of such installments of the appropriation herein made as shall become due to any state before the adjournment of the regular session of legislature meeting next after the passage of this act shall be made upon the assent of the governor thereof, duly certified to the Secretary of the Treasury.

SECT. 3. That if any portion of the moneys received by the designated officer of the state or territory for the further and more complete endowment, support, and maintenance of colleges, or of institutions for colored students, as provided in this act, shall, by any action or contingency, be diminished or lost, or be misapplied,

it shall be replaced by the state or territory to which it belongs, and until so replaced no subsequent appropriation shall be appropriated or paid to such state or territory; and no portion of said moneys shall be applied, directly or indirectly, under any pretense whatever, to the purchase, erection, preservation, or repair of any building or buildings. An annual report by the president of each of said colleges shall be made to the Secretary of Agriculture, as well as to the Secretary of the Interior, regarding the condition and progress of each college, including statistical information in relation to its receipts and expenditures, its library, the number of its students and professors, and also as to any improvements and experiments made under the direction of any experiment stations attached to said colleges, with their costs and results, and such other industrial and economical statistics as may be regarded as useful, one copy of which shall be transmitted by mail free to all other colleges further endowed under this act.

SECT. 4. That on or before the first day of July in each year, after the passage of this act, the Secretary of the Interior shall ascertain and certify to the Secretary of the Treasury as to each state and territory whether it is entitled to receive its share of the annual appropriation for colleges, or of institutions for colored students, under this act, and the amount which thereupon each is entitled, respectively, to receive. If the Secretary of the Interior shall withhold a certificate from any state or territory of its appropriation the facts and reasons therefor shall be reported to the President, and the amount involved shall be kept separate in the Treasury until the close of the next Congress, in order that the state or territory may, if it should so desire, appeal to Congress from the determination of the Secretary of the Interior. If the next Congress shall not direct such sum to be paid it shall be covered into the Treasury. And the Secretary of the Interior is hereby charged with the proper administration of this law.

SECT. 5. That the Secretary of the Interior shall annually report to Congress the disbursements which have been made in all the states and territories, and also whether the appropriation of any state or territory has been withheld, and if so, the reasons therefor.

SECT. 6. Congress may at any time amend, suspend, or repeal any or all of the provisions of this act.

Approved August 30, 1890.

SUMMARY OF
METEOROLOGICAL OBSERVATIONS
TAKEN AT THE
MAINE STATE COLLEGE of AGRICULTURE and the MECHANIC ARTS,

Latitude, $44^{\circ} 54' 2''$ N. Longitude, $68^{\circ} 40' 11''$ W.

FROM JANUARY, 1869, TO JANUARY, 1891.

BY PRESIDENT FERNALD.

Height of instruments above the level of the sea, 134 feet until June, 1879,
and 129 feet since that date.

Explanations, Deductions and Remarks.

The hours of observation are the same as those formerly adopted by the Smithsonian Institution, viz: 7 A. M. and 2 P. M., and 9 P. M., local time.

The figures in the columns headed "Force or pressure of vapor," show the height at which a column of mercury is maintained by the weight of the moisture of the air.

The warmest day of the year 1890 was August 4th, when the mean temperature was 77°.0, and the coldest day was January 10th, when the mean temperature was 11°.7 below zero.

The highest temperature (86°.4) recorded during the year was on the 4th of August, and the lowest temperature (36°.3 below zero) on the 31st of December.

The range of temperature between the two extremes is 122°.7, which is greater by 9°.4 than the average range between the extremes for the last twenty-two years.

The warmest day within the period covered by the tables was August 7th, 1876, when the mean temperature was 85°.3, and the coldest day January 8th, 1878, when the mean temperature was 17°.2 below zero. The highest temperature (96°.7) occurred on August 6th, 1876, and the lowest temperature (36°.3. below zero) on December 31st, 1890.

A comparison, as regards temperature, of the several months of 1890, with the mean temperature of corresponding months for twenty-two years, is given below:

Months.	Mean Temperature from 1869 to 1890, inclusive.	Mean Temperature for 1890.	
January.....	15°.59	17° 63	2°.04 warmer.
February.....	18°.91	22°.61	3°.70 "
March.....	27°.20	28°.92	1°.72 "
April.....	40°.02	39°.85	0°.17 colder.
May.....	52°.56	52°.11	0°.45 "
June.....	62°.36	59°.50	2°.86 "
July.....	67°.45	66°.17	1°.28 "
August.....	65°.47	64°.84	0°.63 "
September.....	57°.37	57°.99	0°.62 warmer.
October.....	45°.85	45°.53	0°.32 colder.
November.....	33°.87	34°.74	0°.87 warmer.
December.....	21°.12	12°.16	8°.96 colder.

The year 1890 (mean temperature 41°.84) averaged 0°.49 colder than the mean temperature of the twenty-two years under notice.

The month of December, 1890, (mean temperature 12°.16) was the coldest December in twenty-two years, the nearest approach being in 1872, when the mean temperature of December was 13°.39.

The latest spring frost was on May 12th. Summer frosts occurred on July 10th, 12th and 19th, that on the 12th being somewhat destructive to vegetation in low places. The earliest autumnal frosts were on the mornings of September 22d, 24th and 25th, the last being destructive to vegetation.

The principal thunder storms of 1890 occurred on June 18th and 30th, July 8th, 15th, 16th and 19th, August 10th and 17th, September 18th and October 30th.

The rainfall and melted snow of 1890 amounted to 53.23 inches, a quantity greater by 7.60 inches than the average for twenty-two years; the snowfall was 107.50 inches, a quantity greater by 11.65 inches than the average for the same period.

The number of days in 1890 on which the sky was at least eight-tenths covered with clouds was 105 or 29 per cent of the whole number. The number of days on which at least .01 of an inch of rain or snow fell was 161, or 44 per cent of the whole number; the number of days, therefore, without any considerable quantity of rain or snow, was 204, or 56 per cent of the whole number.

During the months of May, July, August and September the prevailing wind was S. W. and S.; during the month of April, N. E. and N.; during the other months of the year, N. W. and W. High winds prevailed on January 9th, February 5th, 8th, 15th, 20th and 21st, March 2d and 6th, April 15th, May 20th, June 8th and 9th, July 8th, August 27th, September 13th, and December 1st, 7th and 20th.

The wind on the evening of July 8th, attained a velocity of 60 miles an hour, developing into a cyclone, and was accompanied by a violent thunder-storm. In the gale of December 19th, the wind reached a velocity of 54 miles an hour. During the twenty-four hours ending at 1 P. M. December 19th, the wind travelled 770.5 miles, averaging 32.1 miles per hour.

The prevailing wind for the twenty-two years, from 1869 to 1890, inclusive, was from the northwest and west. The relative direction and force of the wind for this period are indicated approximately by the following numbers: N. W. and W., 4; S. W. and S., 3; S. E. and E., 1; N. E. and N., 2.

The principal auroras of 1890 were on the evenings of January 17th, 18th and 21st, February 11th and 13th, July 6th, 16th and 18th, August 14th and 15th, September 10th, 11th and 19th, October 5th and 13th, November 1st, 7th, 8th, 13th and 15th. The principal lunar halos were on January 4th, 8th, 26th and 29th, February 1st, March 30th and 13th, August 28th, October 23rd and 24th, and the principal solar halos on January 18th and 21st, February 10th, 11th and 17th, March 25th and 31st, April 7th, 8th and 29th, May 7th and August 29th.

The meteorology of the year has been remarkable in its optical phenomena. On January 14th three mock-suns were visible at 4 P. M., and on the 21st, near sunset, a brilliant vertical column was observed, passing through the sun and extending to the horizon. A solar beam was formed also on the morning of February 11th, and on the same day, and on the 15th, mock-suns appeared, as also on the mornings of March 25th and 31st. The phenomenon of rarest occurrence, however, appeared at about 4 P. M., April 8th, when two distinct parhelic circles were formed, with radii of 22 and 46 degrees, the outer one touched by an opposite halo likewise of 46 degrees. On the inner circle four brilliant parhelia (mock-suns) appeared. This phenomenon continued with gradual variations for more than an hour. Parhelia and solar beams were visible also on April 29th.

The Zodiacal light was observed on the evenings of January 17th, 18th, 21st and 29th, February 9th, 10th, 11th, 12th, 13th, 15th, 16th and March 9th

The fall of meteors was especially conspicuous on the evenings of August 11th and 12th.

The barometer indicated the greatest pressure in the month of January, and the least in the month of March. The range between the two extremes was 1.677 inches. The least mean pressure was during October and the greatest during September, when the average height of the mercury in the barometer at an elevation of 129 feet above the sea level was 30.004 inches.

The mean humidity of the air for the year was .80.

SUMMARY BY MONTHS—1890.

MONTHS.	THERMOMETER IN THE OPEN AIR.									RAIN AND SNOW.		Ct./ps.	WINDS.				BAROMETER.			Relative humidity or fraction of saturation.				
	Mean of warmest day.		Mean of coldest day.		Highest temperature.		Lowest temperature.		Mean of maximum temperatures.	Mean of minimum temperatures.	Mean of three daily observations.		Amount of rain and melted snow— inches.	Amount of snow—inches.	Per cent of direction and force.				Barometer height reduced to freezing point of water.					
	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.							N. W. and W.	S. W. and S.	S. E. and E.	N. E. and N.	Maximum.				Minimum.	Mean.
									°	°	°		°	°										
January	250.9	10 11.7	257.8	11 23.0	27.06	7.52	17.63	3.33	19.50	.58	.59	.07	.12	.22	30.741	29.170	30.002	100	43	80				
February	1440.0	21 1.3	1546.2	23 8.8	31.25	12.19	22.61	4.52	13.00	.45	.53	.31	.02	.14	30.642	29.129	29.945	100	47	82				
March	1240.7	7 9.3	1446.9	10 10.0	16.55	20.30	28.92	5.81	36.00	.62	.36	.21	.09	.34	30.439	29.064	29.849	100	36	82				
April	2350.9	18 29.6	2364.3	2 22.3	49.42	30.95	39.85	2.02	6.00	.40	.34	.26	.04	.36	30.393	29.310	29.914	100	35	69				
May	2060.4	2 38.5	1673.4	2 33.0	61.22	43.44	52.11	10.52	-	.62	.21	.28	.26	.25	30.258	29.489	29.847	100	42	81				
June	1770.4	13 51.3	1781.8	3 43.9	68.10	51.11	59.50	3.84	-	.59	.43	.22	.19	.16	30.100	29.551	29.797	100	43	81				
July	3075.8	18 57.3	3086.4	22 45.6	75.95	56.46	66.17	3.84	-	.53	.20	.35	.32	.13	30.136	29.363	29.874	100	46	80				
August	477.0	23 56.2	489.4	19 44.6	71.99	55.90	64.84	4.55	-	.47	.26	.38	.19	.17	30.164	29.251	29.857	100	37	81				
September	1369.1	24 44.6	676.4	25 33.4	66.78	49.36	57.99	4.67	-	.53	.31	.35	.15	.19	30.347	29.578	30.004	100	44	82				
October	463.5	22 34.7	277.5	23 24.1	55.10	36.76	45.53	3.36	-	.47	.34	.27	.12	.27	30.339	29.106	29.731	100	33	79				
November	748.0	28 19.5	655.9	24 12.2	41.21	26.83	34.74	2.67	4.50	.62	.52	.21	.16	.11	30.327	29.276	29.847	100	45	82				
December	1827.3	2 5.3	446.8	31 36.3	21.98	0.39	12.16	4.10	28.50	.44	.71	.04	.08	.17	30.551	29.119	29.860	100	50	84				
Year	477.0	10 11.7	486.4	31 36.3	50.55	32.60	41.84	53.23	107.60	.53	.40	.25	.14	.21	30.741	29.064	29.877	100	35	80				

METEOROLOGICAL.

SUMMARY BY YEARS—From 1869 to 1890, inclusive.

YEAR	TEMPERATURE IN THE OPEN AIR.									RAIN AND SNOW.		Cl ps.	WINDS.				BAROMETER.			Force or pressure of vapor in inches.			Relative humidity or fraction of saturation.				
	Mean of hottest day.		Mean of coldest day.		Highest temperature	Lowest temperature		Mean of maximum temperatures	Mean of minimum temperatures.	Mean of three daily observations.	Amount of rain or melted snow in gauge—inches.		Depth of snow—inches.	Per cent of direction.				Barometer height reduced to freezing point.									
	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.	Day.							Temperature.	N. W. and W.	S. W. and S.	S. E. and E.	N. E. and N.	Maximum.							Minimum.	Mean.
1869,	July 11	74.2	Jan. 22	-3.8	July 11	87.2	Mar. 6	-22.0	50.01	33.37	41.77	44.72	84.92	.55	.41	.29	.14	.16	30.519	28.858	29 780	.826	.005	.250	100	25	76
1870,	July 24	82.8	Jan. 14	-9.7	July 24	94.0	Feb. 4	-17.0	53.02	35.45	44.26	40.98	78.75	.50	.35	.33	.10	.22	30.578	28.902	29.791	.878	.016	.279	100	13	74
1871,	May 30	76.0	Jan. 23	-14.9	May 30	88.6	Jan. 23	-20.6	50.44	33.33	41.92	41.63	80.50	.50	.42	.33	.10	.15	30.583	29.000	29.795	.956	.006	.244	100	17	75
1872,	July 16	79.5	Dec. 25	-11.8	June 30	90.6	Jan. 25	-23.0	50.02	33.22	41.60	48.54	113.00	.53	.37	.28	.13	.22	30.446	28.712	29.706	.793	.011	.258	100	23	77
1873,	July 30	75.5	Jan. 30	-4.9	July 26	92.0	Jan. 30	-26.5	49.93	31.28	40.93	40.78	124.00	.49	.38	.30	.10	.22	30.680	28.423	29.794	.778	.009	.232	100	20	74
1874,	July 15	76.3	Jan. 26	15.5	July 15	86.3	Feb. 2	-26.0	50.18	32.21	41.35	44.94	132.00	.52	.37	.36	.08	.19	30.719	28.981	29.825	.794	.009	.240	100	19	76
1875,	Aug. 29	74.8	Nov. 30	-9.8	Aug. 29	87.8	Dec. 20	-23.0	48.49	30.11	39.58	41.94	93.80	.50	.40	.30	.09	.15	30.550	28.939	29.814	.844	.014	.239	100	24	76
1876,	Aug. 7	85.3	Feb. 24	13.4	Aug. 6	96.7	Dec. 26	-21.5	50.74	32.32	42.03	52.37	123.00	.49	.43	.30	.08	.19	30.783	28.458	29.808	.935	.014	.250	100	21	76
1877,	Aug. 24	75.1	Jan. 25	11.3	June 1	89.0	Jan. 26	-32.5	52.45	33.63	43.39	40.17	66.50	.52	.34	.30	.12	.24	30.494	28.888	29.837	.762	.009	.269	100	19	76
1878,	June 30	81.9	Jan. 8	17.2	June 30	93.5	Jan. 8	-35.6	52.07	35.38	44.34	48.57	59.50	.56	.33	.33	.13	.21	30.554	28.794	29.796	.872	.009	.280	100	20	78
1879,	July 16	77.8	Dec. 21	11.7	Aug. 2	88.0	Dec. 27	-26.0	50.10	31.67	41.62	46.73	112.00	.51	.38	.37	.07	.18	30.638	28.537	29.851	.843	.012	.258	100	15	75
1880,	July 10	82.3	Feb. 2	-4.4	July 10	94.8	Jan. 14	-15.4	52.05	33.50	43.85	33.81	69.00	.50	.39	.23	.18	.20	30.644	29.090	29.874	.790	.015	.269	100	23	75
1881,	Aug. 5	78.1	Feb. 2	-9.1	Aug. 5	91.0	Jan. 2	-18.2	52.11	34.98	43.87	42.80	54.50	.54	.45	.18	.14	.23	30.647	28.919	29.862	.891	.019	.281	100	21	77
1882,	Aug. 6	80.7	Jan. 24	-10.0	Aug. 5	92.0	Jan. 25	-22.4	50.76	33.10	42.54	41.26	110.00	.49	.46	.18	.12	.24	30.724	29.121	29.885	.819	.016	.261	100	24	75

1883,	July 6	75.1	Dec. 23	-13.1	July 7	85.6	Jan. 6	-25.0	50.04	31.79	40.72	40.60	53.00	.48	.41	.30	.13	.16	30.641	28.750	29.904	.860	.015	.259	100	18	78	
1884,	Aug. 18	77.2	Dec 20	10.4	Aug. 18	86.0	Jan. 28	-29.0	51.57	33.23	42.85	44.95	90.00	.56	.35	.33	.14	18	30.716	28.768	29.875	-	-	-	100	16	81	
1885,	July 25	76.4	Jan 22	11.5	July 25	89.2	Jan. 31	-22.3	50.94	32.30	41.37	52.99	108.00	.49	.41	.32	.11	16	30.608	28.800	29.849	-	-	-	100	24	79	
1886,	July 7	78.0	Jan 12	15.3	July 7	92.5	Jan 12	-26.5	52.20	33.24	42.61	18.04	136.50	.53	.40	.35	.10	15	30.731	28.556	29.889	-	-	-	100	10	78	
1887,	July 2	82.5	Jan. 9	13.8	July 2	93.3	Jan. 9	-29.0	51.05	32.90	42.07	52.88	115.25	.52	.44	.31	.09	16	30.810	28.917	29.883	-	-	-	100	20	79	
1888,	July 5	78.5	Jan. 15	-6.9	Jan. 23	93.4	Jan 25	19.6	49.79	32.02	41.26	58.04	134.60	.56	.51	.16	.13	20	30.686	28.859	29.851	-	-	-	100	29	79	
1889,	June 30	75.1	Feb. 23	-8.0	May 18	89.0	Feb 24	-20.3	54.51	36.29	45.11	42.94	64.30	.54	.37	.33	.11	19	30.833	28.781	29.870	-	-	-	100	26	78	
1890,	Aug 4	77.0	Jan. 10	-11.7	Aug. 4	86.4	Dec 31	36.3	50.55	32.60	41.84	53.23	107.50	.53	.40	.25	.14	21	30.741	29.064	29.877	-	-	-	100	35	80	
1876.	1876.	1876.	1876.	1876.	1876.	1876.	1890.	1890.	Mn.	Mean.																		
22 yrs	Aug. 7	85.3	Jan. 8	-17.2	Aug. 6	96.7	Dec 31	-36.3	51.0	33.59	42.33	45.63	95.8	.52	.41	.28	.11	20	30.833	28.423	29.842	-	-	-	100	10	77	

APPENDIX.

CATALOGUE

OF THE

Maine State College of Agriculture and Mechanic Arts.

ORONO, MAINE, 1890-91.

TRUSTEES :

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HON. WM. T. HAINES, B. S. LL. B., WATERVILLE, *Secretary*.
HON. FRED ATWOOD, WINTERPORT.
GEN. R. B. SHEPHERD, SKOWHEGAN.
ARTHUR L. MOORE, B. S., WATERVILLE.
RUTILLUS ALDEN, Esq., WINTHROP.
HON. CHARLES P. ALLEN, B. S., PRESQUE ISLE.
HON. RUFUS PRINCE, SOUTH TURNER.

TREASURER :

PROF. G. H. HAMLIN, ORONO.

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WM. H. STRICKLAND, Esq.
GEN. R. B. SHEPHERD.
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EXAMINING COMMITTEE :

HIS EXCELLENCY EDWIN C. BURLEIGH.
REV. CHARLES F. ALLEN, D. D.
WM. B. LAPHAM, M. D.

FACULTY.

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and Professor of Physics and Mental and Moral Science.

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Professor of Natural History.

GEORGE H. HAMLIN, C. E.,
Professor of Civil Engineering.

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Professor of Modern Languages, Logic and Political Economy.

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Professor of Agriculture.

WALTER FLINT, M. E.,
Professor of Mechanical Engineering.

JAMES N. HART, C. E.,
Professor of Mathematics.

LIEUT. EVERARD E. HATCH, 18th U. S. INFANTRY,
Professor of Military Science and Tactics.

HOWARD S. WEBB, B. M. E.,
Instructor in Shop-Work, Secretary and Registrar.

FREMONT L. RUSSELL, B. S., V. S.,
Instructor in Veterinary Science.

FRED P. BRIGGS, B. S.,
Assistant in Natural History.

NATHAN C. GROVER, B. C. E.,
Assistant in Civil Engineering.

HARRIET CONVERSE FERNALD, M. S.,
Librarian.

AARON E. SPENCER,
Steward.

STUDENTS.

POST GRADUATE.

Hancock William Jerome, B. S , Antioch College, Yellow Springs, O.

GRADUATES OF 1890.*

Andrews, Frank Orris,	Rockland.
Babb, George Herbert,	Sebago.
Bird, John, 2d,	Rockland.
Blackington, Ralph Harvey,	Rockland.
Clark, Hugo,	Lincoln.
Coffin, Alphonso John.	Harrington.
Croxford, Walter Everett,	Jackson.
Dow, Fred Todd,	Gorham.
Drew, Albert Wilson,	Canaan.
Dunton, Harris Drummond,	Boothbay.
Farrington, Horace Parker,	Cape Elizabeth.
Gould, George Pendleton,	Stillwater.
Grover, Nathan Clifford,	West Bethel.
Hardison, Allie Crosby,	Caribou.
Harvey, Chandler Cushman,	Fort Fairfield.
Hayes, Samuel Henry Tewksbury,	Oxford.
Heath, Everett Fenno,	Bangor.
Kelley, Edward Havener,	Belfast.
Keyes, George Edwin,	Hampden.
Morey, Elmer Lake,	Colombo, Ceylon.

*The annual report being made in December, includes parts of two academic years, hence the catalogue bears the names of students who have been connected with the College during any portion of the year 1890.

Morrill, Edmund Needham,
Owen, John Wesley, Jr.,
Peirce, Varna John,
Peirce, William Bridgham,
Pierce, William Barron,
Pillsbury, George Melville,
Quincy, Fred Grant,
Rackliffe, Joseph Riley,
Reed, Fullerton Paul,
Sawyer, Frank Wade,
Swan, Clarence Buzzell,
Wallace, Chester Jay,
Webb, Winfield Scott,
Wight, Ralph Holbrook,
Williams, Charles Sampson,

Deering.
Saco.
Hudson.
Hudson.
Harpwell.
North Scarboro'.
Masardis.
Hampden.
Boothbay.
Milford.
Old Town.
Jackson.
Caribou.
Belfast.
Portland.

SENIOR CLASS.

Arey, Ralph Jesse,	Hampden.
Bailey, William Melvin,	Malden, Mass.
Clark, Edmund,	Bethel.
Clayton, Charles,	Bangor.
Davis, James Walter,	Yarmouthville.
Farrington, Wallace Ryder,	Cape Elizabeth.
Farrington, William Rowe,	Portland.
Flanagan, John Henry,	Rockland.
Graves, Joseph Colburn,	Orono.
Hall, Bert Austin,	Shapleigh.
Hamlin, Cyrus,	Bangor.
Keith, William Everett,	Old Town.
Keyes, Prescott, Jr.,	Litchfield Corner.
Kilbourne, Charles Herbert,	North Waterford.
Lord, Robert William,	Skowhegan.
Menges, Hugo Gustave,	Bangor.
Merrill, True Lander,	Orono.
Merrill, Edwin Reuel,	Yarmouthville.
Miller, Albert Morton,	Waldoboro.
Moulton, Fred Charles,	Hiram.
Patten, William Nickels,	Cherryfield.
Scott, Clarence,	Olamon.
Starrett, Henry Vaill,	Warren.
Steward, John White,	Skowhegan.
Taylor, Charles Norton,	Hampden.
Thompson, George Edward,	Orono.
Tirrill, Leonard Alexander,	Holden.
Valentine, William Alton,	Bethel.

JUNIOR CLASS.

Alexander, John Francis,
 Atherton, George Frederic,
 Atkinson, William Hacker,
 Bourne, Frank Augustus,
 Bristol, Mortimer Leonard,
 Butterfield, William Rowe,
 Clark, Roscoe Conkling,
 Danforth, Ernest Wilbur, '
 Doolittle, Herbert Edward,
 Farrington, Mellen Edward,
 Fernald, Robert Heywood,
 Gibbs, John Clinton,
 Grover, Arthur Curtis,
 Healey, Warren Evans,
 Holden, William Cross,
 Maguire, George Patrick,
 McKechnie, Willard Erastus,
 Nealley, Calvin Henry,
 Page, Warren Robin,
 Prentiss, Harry Mellen,
 Prince, Job,
 Randlette, Charles Maurice,
 Rich, George Frank,
 Timberlake, Stanley Milton,
 Tolman, Frank Stevens,
 Tyler, Joseph Albert,
 Williams, Lafortest Charles,

Richmond.
 Newry.
 Brunswick.
 Bangor.
 Canton Ctr., Conn.
 Milford.
 Bethel.
 Brunswick.
 Northfield, Mass.
 Brewer.
 Orono.
 So. Turner.
 West Bethel.
 Rockland.
 So. Windham.
 Biddeford.
 Princeton.
 Monroe.
 Hampden.
 Brewer.
 So. Turner.
 Richmond.
 Bethel.
 No. Turner Bridge.
 Milo.
 Farmington.
 Athens.

SOPHOMORE CLASS.

Alexander, James Almore,	Richmond.
Alford, Abbott Edwin,	Old Town.
Atkinson, Timothy Ralph,	North Anson.
Buck, Hosea Ballou,	Stillwater.
Chapman, Clarence Leslie,	Newburgh.
Cobb, Charles Edward,	Patten.
Cooper, Walter,	West Searsmont.
Crosby, Walter Wilson,	Bangor.
Durham, Leroy Tolford,	Monroe.
French, Charles Frederick,	Glenburn.
Gannett, Charles Henry,	Augusta.
Gould, Harris Perley,	North Bridgton.
Gray, Jesse Alexander,	Old Town.
Hamlin, Edwin Thompson,	Bangor.
Hammatt, William Cushing,	Bangor.
Haynes, Charles Irving,	Bangor.
Hutchinson, George Weymouth,	Orono.
Jack, Walter Dows,	Topsham.
Jerrard, John,	Bangor.
Johnston, Chesley Metcalf,	Bangor.
Jordan, Alva Thomas,	South Lewiston.
Kittredge, Charles Prentiss,	Milo.
Lewis, Hugh McLellan,	South Berwick.
Morris, John Richard,	Bangor.
Murphy, Charles Clark,	Hampden.
Robinson, Harry Orman,	Bangor.
Rowe, George Freeman,	Bangor.
Shaw, Orrin John,	Hampden.
Smith, Harry Maubic,	Bangor.
Smith, Lizzie Louise,	Veazie.
Smith, Ralph Kendrick,	Bangor.
Steward, George Henry Colburn,	Orono.
Webster, John Milton,	Augusta.
Whitney, George Ansel,	Madison.
Williams, Hiram,	Portland.
Wilson, Pearly Rupert,	Solon.
Young, Thomas Jefferson,	Athens.

FRESHMAN CLASS.

Blagden, Judson Billings,	Bluehill.
Bowler, Frank Colburn,	Berlin, N. H.
Bradford, Charles Frank,	Union.
Calderwood, Isaac Glidden,	Vinalhaven.
Cowan, Edward Henry,	Orono.
Cowan, George Parker,	Bangor.
Fernald, Merritt Lyndon,	Orono.
Gilbert, Charles Edward,	Orono.
Gould, Frank Gilman,	Orono.
Hall, George Harry,	Bangor.
Hayes, Augustus Daniel,	Belfast.
Johnson, William Asbury,	Orono.
Jose, Wallace Hight,	Newport.
Kimball, James Mayberry,	Bangor.
Murray, Herbert,	Rockland.
Norwood, Leon Orlando,	Union.
Ricker, John Hale,	Cherryfield.
Rumball, George Washington,	Harrington.
Smith, Abbott Currier,	Bangor.
Wood, Edward Butler,	Camden.

SUMMARY.

Post Graduate,	1	Juniors,	27
Graduates of 1890,	35	Sophomores,	37
Seniors,	28	Freshmen,	20
		Total,	<u>148</u>

PRIZES FOR 1889.

Prentiss Prize, for best Junior Essay, awarded to Prescott Keyes, Jr., of Litchfield Corner, and Fred Charles Moulton of Hiram.

Prentiss Prize, Sophomore Declamation, awarded to Harry Mellen Prentiss of Brewer, and Roscoe Conkling Clark of Bethel.

Libbey Prize, for best Agricultural Essay, awarded to Edward Havener Kelley of Belfast.

The Franklin Danforth Memorial Prize for highest standing Senior year course in Agriculture, awarded to Edward Havener Kelley of Belfast.

Award for highest standing, Sophomore Class, to Herbert Edward Doolittle, Northfield, Mass., and Arthur Curtis Grover, West Bethel.

Award for highest standing, Freshman Class, to Charles Henry Gannett of Augusta.

MILITARY DEPARTMENT.

COBURN CADETS.—FIELD AND STAFF.

First Lieutenant EVERARD E. HATCH, 18th U. S. Infantry,
Commanding.

Cadet EDMUND CLARK, Major and Commandant of Cadets.

Cadet JOHN W. STEWARD, First Lieutenant and Adjutant.

Cadet HENRY V. STARRETT, First Lieutenant and Quartermaster.

Cadet ROBERT H. FERNALD, Sergeant Major.

Co. A.

Co. B.

<i>Captain</i>	Wallace R. Farrington	Edwin R. Merrill.
<i>1st Lieutenant</i>	William N. Patten	Hugo G. Menges.
<i>2nd</i> "	True L. Merrill	Robert W. Lord.
<i>3rd</i> "	Cyrus Hamlin	Wm. R. Farrington.
<i>1st Sergeant</i>	William C. Holden	George F. Rich.
<i>Sergeant</i>	Mortimer L. Bristol	Arthur C. Grover.
"	Henry M. Prentiss	George F. Atherton.
"	Frank S. Tolman	George P. Maguire.
"	Warren E. Healey	Leslie A. Boadway.
<i>Corporals</i>	Walter W. Crosby	Walter D. Jack.
"	John W. Webster	Pearley D. Wilson.
"	George H. C. Steward	Charles H. Gannett.
"	Harry M. Smith	

COLOR GUARD.

Color Sergeant, Charles M. Randlette.

" *Corporal*, Walter W. Crosby.

" " Walter D. Jack.

" " John M. Webster.

DESIGN OF THE INSTITUTION.

It is the design of the Maine State College of Agriculture and the Mechanic Arts to give, at a moderate cost, the advantages of a thorough, liberal and practical education. It seeks to do this by means of approved methods of instruction, and especially by making prominent the system of practically applying in the drawing-room, in the laboratory, in the shop and in the field, the lessons of the class-room. It thus endeavors to make its courses of high practical value.

By the act of Congress granting public lands for the endowment and maintenance of such colleges, it is provided that the leading object of such an institution 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."

While the courses of study fully meet this requisition, and are especially adapted to prepare the student for agricultural and mechanical pursuits, it is designed that they shall be also sufficiently comprehensive, and of such a character, as to secure the discipline of mind and practical experience necessary for entering upon other callings or professions.

CONDITIONS OF ADMISSION.

Candidates for admission to the Freshman Class must be not less than sixteen years of age, and must pass a satisfactory examination in Arithmetic, Geography, English Grammar (especial attention should be given to Orthography, Punctuation and Capitals,) History of the United States, Physical Geography, Book-Keeping, Algebra to Logarithms, and Plane Geometry.

Although the knowledge of Latin is not required as a condition of admission, yet the study of this language is earnestly recommended to all who intend to enter this Institution.

Candidates for advance standing must sustain a satisfactory examination in the preparatory branches, and in all the studies previously pursued by the class they propose to enter.

Satisfactory testimonials of good moral character and industrious habits will be rigidly exacted. They should be presented on the day of examination.

The Friday following the last Wednesday of June, and the day of the beginning of the first term in August, are the appointed times for the examination of candidates at the college.

Arrangements have been made by which applicants accommodated by the plan may pass examination for admission without incurring the expense of coming to Orono. The gentlemen named below have been appointed examiners in the sections of the State in which they severally reside.

C. P. Allen, B. S.,	Presque Isle.
H. M. Estabrook, M. S.,	Gorham.
E. S. Danforth, B. S., }	Skowhegan.
S. W. Gould, B. S., }	
Henry K. White, A. M.,	Newcastle.
Ashley St. Clair,	Milltown.
I. C. Phillips, A. B.,	Wilton.
Hon. N. A. Luce,	Augusta.
W. R. Whittle, A. B.,	Ellsworth.
W. E. Sargent, A. M.,	Hebron.
Edwin P. Sampson, A. B.,	Saco.
A. D. Hall, A. B.,	Bethel.

Examiners will indicate to parties applying, the time and special place of examination. Arrangements have also been made with the Seminary at Bucksport and with the Academy at Hampden, by which students from these institutions may be admitted to the college on certificate of qualification from the respective Principals.

All candidates, wherever they may arrange to be examined, should make early application to the president of the college. Applications will be recorded and regarded in the order of their reception.

COURSES OF INSTRUCTION.*

Five full courses are provided, viz: A course in Agriculture, in Civil Engineering, in Mechanical Engineering, in Chemistry, and in Science and Literature.

The studies of the several courses are essentially common for the first year, and are valuable not only in themselves, but also as furnishing a necessary basis for the more technical studies and the practical instruction of the succeeding years.

*The several courses as shown in subsequent pages of the catalogue will undergo revision before the autumn of 1891. A brief course in Agriculture occupying not more than two years will be established as soon as the necessary arrangements can be made.

Physical Geography, required on admission, serves as a suitable introduction to Geology, which is taken up in each of the courses. Physiology serves as an introduction to Comparative Anatomy, and Algebra, Geometry and Trigonometry, taught in the first year, are needed preliminaries to the higher mathematics and the practical applications required in Surveying, Engineering proper and Astronomy. Botany, Chemistry and Physics are highly important branches, common to all the assigned courses, and hence taken by all the students who are candidates for degrees.

Rhetoric, French and English Literature from the early part of the line of studies which later includes German, Logic, History of Civilization, United States Constitution, Political Economy, and Mental and Moral Science, branches, several of which relate not more to literary culture than to social and civil relations, and to the proper preparation for the rights and duties of citizenship.

Composition and Declamation are regular exercises in all the courses throughout the four years. For the characteristic features of each course, reference is made to the explanatory statements following the several schemes of study.

SPECIAL COURSES.

Students may be received for less time than that required for a full course, and they may select from the studies of any class such branches as they are qualified to pursue successfully. Students in Special Courses are not entitled to degrees, but may receive certificates of proficiency.

DEGREES.

The full course in Civil Engineering entitles to the Degree of Bachelor of Civil Engineering; the full course in Mechanical Engineering, to the Degree of Bachelor of Mechanical Engineering; the full course in Agriculture, Chemistry, or Science and Literature, to the Degree of Bachelor of Science.

Three years after graduation, on presentation of a satisfactory thesis with the necessary drawings, and proof of professional work or study, the Bachelors of Civil Engineering may receive the Degree of Civil Engineer; the Bachelors of Mechanical Engineering, the Degree of Mechanical Engineer; the Bachelors of Science, the Degree of Master or Science.

COURSE IN AGRICULTURE.

FIRST YEAR.

<i>First Term.</i>	<i>Second Term.</i>
Physiology.	Botany.
Rhetoric.	French.
Solid Geometry.	Logarithms and Trigonometry.
P. M. Labor on Farm.	P. M. Labor on Farm.
Free-Hand Drawing.	Mechanical Drawing. (F. of T.)
Dissecting.	Botanical Laboratory Work. (L. of T.)

SECOND YEAR.

<i>First Term.</i>	<i>Second Term.</i>
Botany.	Qualitative Chemistry.
General Chemistry.	Physics. (F. of T.)
French.	German.
Physics.	Surveying. (L. of T.)
P. M. Laboratory Work in Botany.	English History (L. of T.) for ladies.
Laboratory Work in Physics.	P. M. Field Work and Forge Work.
	Laboratory Physics.
	French Translations for V.

THIRD YEAR.

<i>First Term.</i>	<i>Second Term.</i>
Agricultural Engineering, including Farm Implements, Farm Drainage and Mechanical Cultivation of the Soil.	Agricultural Chemistry, Landscape Gardening, Horticulture and Arboriculture and Farm Accounts.
Agricultural Chemistry or Advanced Chemistry, for V.	Zoology and Entomology.
English and American Literature.	Logic.
German.	P. M. Laboratory Work and Experimental Farming or *Analysis of English Authors, and German Translations.
P. M. Laboratory Work or *Analysis of English Authors and Translations from French.	

FOURTH YEAR.

<i>First Term.</i>	<i>Second Term.</i>
Cattle Feeding and Dairy Farming.	Stock Breeding and Veterinary Science. Sheep Husbandry and Cultivation of Cereals.
Comparative Anatomy.	
History of Civilization.	Mineralogy and Geology.
Political Economy.	
P. M. Experimental Farming and Agricultural Botany or *Translations from German.	U. S. Constitution.
	Mental and Moral Science.
	P. M. Thesis and Laboratory Work and Theme and Thesis Work.

*To be taken in Course in Science and Literature in place of study preceding.

EXPLANATORY STATEMENTS.

This course is designed to fit young men to follow Agriculture as a profession with success, as well as to prepare them for the intelligent performance of the duties of citizenship.

To this end, the curriculum of studies is largely scientific and technical, not omitting, however, those branches that have been referred to as pertaining to social and civil relations.

The instruction in Agriculture is given largely by lectures, and embraces subjects of great practical importance to the farmer, which are briefly explained under the following heads :

Agricultural Engineering.—Combined with recitations in mechanics from a text-book, lectures are given on the principles of construction and use of farm implements, illustrated by charts to the extent possible, on the construction of roads, culverts and masonry, and on soil physics, or the relations of the soil to heat and moisture, the mechanical conditions of the soil best adapted to plant growth, and the objects to be gained by cultivation.

Agricultural Chemistry.—Under this head are considered the various methods of retaining and increasing the fertility of the soil, the sources, composition and methods of valuation of commercial and farm manures, together with the principles governing their treatment and application, the composition of cattle foods, their changes and uses in the animal system, and the value and economic use of the various kinds of fodders.

Landscape Gardening.—The object of this study is to furnish correct ideas of the manner of laying out and beautifying grounds. This subject is followed by lectures on Horticulture and Arboriculture.

Cultivation of Cereals.—Lectures are given upon the best methods of cultivating the principal farm crops.

Dairy Farming.—This embraces the chemical and physical properties of milk, and the principles and practical operations that underlie its production and manufacture into butter and cheese.

Sheep Husbandry.—The characteristics and comparative merits of our different breeds of sheep are discussed, also their adapt ability to different conditions and uses.

Botany.—Following recitations and practical work in Botany, lectures are given upon fungi injurious to the farmer.

Chemistry.—One term is devoted to General Chemistry, two terms to Agricultural Chemistry, one-half term to Organic Chemistry, and the afternoons of several terms are devoted to laboratory practice, including analysis of farm products.

Zoology and Entomology.—In Zoology the larger groups of the animal kingdom are taken up and described in lectures which are illustrated by means of diagrams, models, or the objects themselves, and the students are required to make critical studies of typical animals of each group. Such laboratory practice is regarded an indispensable training for the more advanced study of the higher animals, and also forms the basis of the study of Historical Geology.

The studies in Entomology are conducted in a similar manner. After a general review of the orders has been given, illustrated by such common insects as are familiar to all, the beneficial and injurious are taken up more in detail, their round of life described, together with the injuries the latter do to the products of the farmer, the gardener and the fruit raiser, as well as to our forests and building materials, and the best known means of keeping them in check. For the purpose of making the instruction as practical and impressive as may be, many of the injurious insects are carried through their transformations in the class-room, where each student can note the various changes from day to day, and learn to recognize these insect enemies in any stage of their existence; and each member of the class is required to devote some time in field collecting, and in observing the habits and work of insects in nature.

The subject of bee-keeping is taken up quite at length; the different kinds of bees in a swarm, their habits, anatomy, and the mode of collecting the different products are all described and illustrated by means of elaborate models, while artificial swarming, the mode of hybridizing a swarm, and the advantages of the same, with the most approved methods now in use for the care and management of bees, are also fully described.

Comparative Anatomy—Under comparative anatomy are taken up the anatomy and physiology of our domestic animals, together with a brief outline of our wild animals, so far as time permits. This is followed by instruction in stock breeding and veterinary science.

Mineralogy and Geology.—A preliminary course of lectures is given on mineralogy, followed by laboratory practice in the determination of minerals, and in lithology, special attention being called

to gypsum, limestone, and such other minerals as are of direct importance to the students of agriculture.

The institution in Geology is by means of illustrated lectures and excursions, critical attention being given to the origin and formation of soils.

Law.—A course of lectures is given to the Senior Class on International and Rural Law.

Throughout the course, the endeavor is made to inculcate established principles in agricultural science, and to illustrate and enforce them to the full extent admitted by the appliances of the laboratory and the farm. So far as possible, students are associated with whatever experimental work is carried on, that they may be better fitted to continue such work in after life.

Those who complete this course receive instruction also in Mathematics, French, German, English Literature, Logic, United States Constitution, Political Economy, and Mental and Moral Philosophy, and on presenting satisfactory theses upon some agricultural topic, are entitled to the degree of Bachelor of Science.

The Course in Science and Literature includes French and German, the general, mathematical, and most of the scientific studies of the agricultural course. Instead of certain branches quite purely technical in the latter course, History, and English and American Literature are substituted.

In the special laws of the State passed in 1872, it is provided that young ladies "who possess suitable qualifications for admission to the several classes may be admitted as students in the college."

In arranging the course in Science and Literature reference has been had to this enactment. From this course, however, young men who desire it are not excluded, as on the other hand young ladies are not excluded from any of the other courses.

COURSE IN CIVIL ENGINEERING.

FIRST YEAR.

First Term.

Solid Geometry.
 Rhetoric.
 Physiology.
 P. M. Free-Hand Drawing.
 Dissecting.
 Labor on Farm.

Second Term.

Logarithms and Trigonometry.
 Botany.
 French.
 Mechanical Drawing. (F of T.)
 P. M. Botanical Laboratory Work.
 (L. of T.)
 Labor on Farm.

SECOND YEAR.

First Term.

Descriptive Geometry.
 General Chemistry.
 French.
 Physics.
 P. M. Mechanical Drawing.
 Laboratory Work in Chemistry.

Second Term.

Analytical Geometry.
 German.
 Physics. (F. of T.)
 Surveying. (L. of T.)
 Qualitative Chemistry.
 P. M. Field Work.

THIRD YEAR.

First Term.

Calculus.
 Henck's Field Book and R. R. Surveying.
 German.
 P. M. Field Work and Drawing.

Second Term.

Calculus. (F. of T.)
 Descriptive Astronomy. (L. of T.)
 Mechanics. (F. of T.)
 Graphic Statics. (L. of T.)
 Logic.
 P. M. Isometric and Cabinet Projection and Perspective.

FOURTH YEAR.

First Term.

Civil Engineering.
 Stereotomy. (F. of T.)
 Sanitary Engineering. (L. of T.)
 Practical Astronomy.
 Political Economy.
 P. M. Higher Surveying.

Second Term.

Civil Engineering, Designs and Specifications.
 Mineralogy and Geology.
 U. S. Constitution.
 P. M. Designing and Thesis Work.

EXPLANATORY STATEMENTS.

The object of this course is to give the student a thorough knowledge of Higher Mathematics, Mechanics, Astronomy and Drawing, and, at the same time, a thorough drill in the use and care of the ordinary engineering instruments and in the application of the mathematical principles and rules, so that the graduates can at once be made useful in engineering work and be fitted, after a limited amount of experience in the field, to fill positions of importance and trust. The course is also arranged so as to afford, so far as can be, the education required to prepare the graduate for a responsible position among *men*, as well as among engineers.

In this course the work is identical with that of the other courses during the first year. During the fall term of the Sophomore year, students in this course work two hours each afternoon, in the drawing room, on free-hand and mechanical drawing. In the last term of this year, the subject of land surveying is taken up. The first eight weeks are devoted to tinting, shading, etc., in water colors, while the remaining twelve weeks are given to practical surveying. Besides an hour's recitation each day, the class is engaged two hours, either in the field or drawing room, becoming familiar with the use and care of instruments, putting into practice the problems found in the text-book, and making actual surveys.

In the first term of the Junior year, Henck's Field Book is used as a text book, from which the student obtains methods of running railroad curves, putting in switches and turnouts, setting slope-stakes, and the calculation of earthwork. This is supplemented with examples worked by the student, and lectures on levelling, preliminary and final surveys, and on the resistance to trains offered by grades and curves, together with the theory and construction of country roads, streets and pavements. These methods of the text-book, so far as possible, are applied in the field by the execution of the preliminary and final surveys of a railroad from the college buildings to some point on the Maine Central R. R., together with the necessary drawings, calculation of earthwork and estimate of the cost of building and equipping the same.

The subject of Applied Mechanics is taken up the last term of this year, in which the students receive a thorough training in the principles underlying construction, illustrated as far as possible by practical examples, in which these principles are applied. During

this term, each student in the class works two hours each day in the drawing room, where isometric, cabinet and perspective projection are taught by means of lectures and problems drawn by the students.

During the first term of the Senior year an extended topographical survey, with the plane table and stadia measurements, is made, based upon a previous trigonometrical determination of the principal points. During this term the students are also taught the use of the current meter and apply their knowledge in the actual measurement of the volume of the Stillwater river.

In the recitation room during this term the principles of the strength of materials are taken up, supplemented by information as to durability, preservation and fitness for special purposes. The theories of ties, struts, beams, foundations, retaining walls and arches, are fully treated.

Stone cutting is taken up this term, by lectures and practical problems, each student being required to make a complete set of working drawings of the most common forms of masonry arches.

Six weeks of this term are devoted to sanitary engineering; especial attention being given to ventilation, heating, purity of water supply and the proper drainage of houses and towns.

The first part of the last term of this year is devoted to the theory of roof and bridge trusses, the principles of hydraulics as applied in engineering practice, lectures on the locomotive engine, while the greater part is given to the application of the principles already learned, to the designing and calculation of various kinds of engineering structures, and to making out estimates and specifications.

This, together with the preparation of a satisfactory thesis, completes the work in the course of Civil Engineering.

MINERALOGY AND GEOLOGY.

Mineralogy is taught by an introductory course of lectures, followed by laboratory practice in the determination of minerals and rocks, especial attention being given to their value for building purposes. This is immediately followed by a course of lectures in Geology, together with excursions for the purpose of studying the rocks *in situ*, and also superficial deposits. Critical examinations are made in various railroad cuts of the hardness, slaty structure, jointed structure, etc., as bearing upon the cost of excavation.

ASTRONOMY.

In the last part of the spring term, Descriptive Astronomy is taken by the students of the Junior Class, and practical Astronomy in the first term, Senior year.

The course in Astronomy is designed to enable students to determine with accuracy geographical positions. The principal instruments employed are chronometer, sextant, transit, and for work of precision, the Repsold vertical circle, an instrument made in Hamburg, Germany, in 1874, for this institution. Practical instruction is given in the use of these instruments, and in the most approved methods of reducing observations for the determination of latitude and longitude.

DEGREES.

Students in this department secure the degree of Bachelor of Civil Engineering on graduating, with the full degree of Civil Engineer three years after, on presentation of a satisfactory thesis, with proof of professional work or study.

COURSE IN MECHANICAL ENGINEERING.

FIRST YEAR.

<i>First Term.</i>	<i>Second Term.</i>
Solid Geometry.	Logarithms and Trigonometry.
Physiology.	Botany.
Rhetoric.	French.
Free-Hand Drawing.	Mechanical Drawing. (F. of T.)
Dissecting.	Botanical Lab'y Work. (L. of T.)
P. M. Labor on Farm.	P. M. Labor on Farm.

SECOND YEAR.

<i>First Term.</i>	<i>Second Term.</i>
Descriptive Geometry.	Analytical Geometry.
French.	Drawing and Kinematics.
Physics.	Physics.
General Chemistry.	Surveying.
P. M. Carpentry.	Qualitative Chemistry.
Lab'y Work in Chemistry.	P. M. Mechanical Drawing and Forge Work.

THIRD YEAR.

<i>First Term.</i>	<i>Second Term.</i>
Calculus.	Calculus. (F. of T.)
Kinematics.	Descriptive Astronomy. (L. of T.)
Vise Work.	Mechanics and Machine Design.
P. M. Machine Drawing.	Logic.
	Elements of Mechanism.
	Link and Valve Motions.
	P. M. Isometric and Cabinet Projection and Machine Drawing.

FOURTH YEAR.

<i>First Term.</i>	<i>Second Term.</i>
Steam Engineering.	Steam Engineering.
Practical Astronomy.	Wood Turning.
Political Economy.	Hydraulic Engineering.
P. M. Machine Drawing and Designing.	Mineralogy and Geology.
	U. S. Constitution.
	P. M. Machine Drawing, Designing and Thesis Work.

EXPLANATORY STATEMENTS.

It is the design of this course to give such a knowledge of Mathematics, Mechanics, Principles of Mechanism, Drawing and Manual Art as shall enable the student successfully to enter practical life as an engineer, with the same thorough education in subjects required to fit him for the general duties of life as is afforded by the other courses.

The first two years' work is identical with that of the students in Civil Engineering except that carpentry and forge work are taken the second year in place of part of the drawing. In the Junior year, the first term is devoted to the geometry of machinery, showing the students how different motions may be obtained independently of the power required. Special attention is here given to the subject of gearing, and a full set of problems worked out, illustrating cases commonly occurring in practice. In the second term of this year the subject of the geometry of machinery is continued by lectures on other methods of transmitting motion, as by belts, cams, couplings, and links. Considerable time is given to the study and designing of the various valve and link motions used on the steam engine. During the same term instruction is given in mechanics, and the laws of the strength of materials, the student being required to design machine details in accordance with those laws.

The first part of the first term, Senior year, is employed in studying the laws of the expansion of steam and their influence upon the construction of steam engines and boilers, the subject being illustrated by experiments on the shop engine, with the aid of an indicator. During the remainder of the term, the students are engaged in designing engines and other machines, and in making detail drawings of the same, such as would be required to work from in the shop.

During the last term, Senior year, the study of steam engineering is continued in its application to compound engines, and the subject of hydraulic engineering is taken up briefly, by lectures on the storage of water for power and the theory and construction of modern water wheels.

TEXT-BOOKS AND BOOKS OF REFERENCE.

Weisbach,	Mechanics of Engineering.	Smith,	Steam Engine.
Goodeve,	Elements of Mechanism.	Smith,	Steam Boiler.
MacCord,	Kinematics.	Trowbridge,	Steam Boilers.
MacCord,	Slide Valve.	Zeuner,	Valve and Link Motions.
Van Buren,	Strength of Machinery.	Auchincloss,	Valve and Link Motions.
Knight,	Mechanical Dictionary.	Clark,	Manual.

SHOP WORK.

There are now three shops equipped according to the Russian system, and work in these is required of all students in this course. The first term of the Sophomore year, two hours of each day are devoted to work in carpentry, special attention being given to accuracy of workmanship.

During the second term of the same year, the student receives instruction in forge work, including the welding and tempering of steel. A course in vise work during the first term of the Junior year gives the student practice in the various methods of shaping and fitting metals by the use of the chisel, hack-saw and file. During their second term, the Junior students in this course take turns in running the shop engine, and are taught the rules of safety and economy in this branch of Engineering. Instruction in wood-turning is given during the last term of the Senior year.

DRAWING.

The work in drawing commences with a course in Free-Hand and Elementary Mechanical Drawing, extending through the Sophomore year.

The first term of the Junior year, the student spends the time allotted to drawing in working out practical problems on the construction of gear teeth, cams, etc., and in elementary practice in line-shading and tinting.

The second term of this year is devoted to isometric projection, and the making of finished drawings in ink and in water colors. In the first term of the Senior year, the student prepares an original design of some machine, makes working drawings of its details on tracing cloth, and finally prepares copies by the blue-print process. The afternoon work of the spring term consists of making calculations for designs of engines and boilers, the construction of the necessary working drawings, and making thesis drawings.

The remarks under Course in Civil Engineering, with regard to Astronomy, Mineralogy and Geology, apply also to this course, and to them reference is made.

Theses are required of all students as a condition of graduation, and must be on some subject directly connected with Mechanical Engineering.

Students in this course receive the degree of Bachelor of Mechanical Engineering upon graduation, with full degree of Mechanical Engineer three years afterwards upon presentation of a satisfactory thesis and proof of professional work or study.

COURSE IN CHEMISTRY.

FIRST YEAR.

<i>First Term.</i>	<i>Second Term.</i>
Physiology.	Botany.
Rhetoric.	French.
Solid Geometry.	Logarithms and Trigonometry.
P. M. Labor on Farm.	P. M. Labor on Farm.
Free-Hand Drawing.	Mechanical Drawing. (F. of T.)
Dissecting.	Botanical Lab'y Work. (L. of T.)

SECOND YEAR.

<i>First Term.</i>	<i>Second Term.</i>
General Chemistry.	Qualitative Chemistry.
Botany.	Physics.
French.	German.
Physics.	Surveying.
P. M. Lab'y Work in Botany,	P. M. Field Work.
Phys'cs, Chemistry.	Laboratory Physics.

THIRD YEAR.

<i>First Term.</i>	<i>Second Term.</i>
Chemistry.	Chemistry.
German.	Zoology and Entomology.
English and American Literature.	Logic.
P. M. Laboratory Work.	P. M. Laboratory Work.

FOURTH YEAR.

<i>First Term.</i>	<i>Second Term.</i>
Chemistry.	Chemical Laboratory Work.
Comparative Anatomy.	Mineralogy and Geology.
History of Civilization.	U. S. Constitution.
Political Economy.	P. M. Laboratory Work.
P. M. Laboratory Work.	

EXPLANATORY STATEMENTS.

This course aims to supply a want felt by students who wish to enter certain industries in which a somewhat extensive knowledge of Chemistry is important. The first two years are mainly like those of the other courses, Qualitative Analysis being, however, obligatory for these students in the second term of the Sophomore year.

During the Junior year, daily recitations are held in advanced Inorganic Chemistry. In the Senior year, advanced Organic Chemistry is taken up. Sophomores have one exercise a week in Elementary Chemical experiments. The afternoons are devoted to Quantitative Chemical Analysis by the Junior and Senior students of the course. The work consists of the most useful gravimetric and volumetric methods, beginning with the simple estimations, which are followed by more complex analysis of alloys, minerals, fertilizers, farm products, &c. A short course in the assay of gold and silver is also given.

The class-room text-books used by this department are: Remsen's Chemistry and Naquet's Principes de Chimie. In the Laboratory are used: Craft's Qualitative Chemical Analysis, Fresenius' Quantitative Chemical Analysis, Frankland's Agricultural Chemical Analysis, Flint's Examination of Urine, Rickett's Notes on Assaying, Appleton's Quantitative Analysis, and Classen's Quantitative Analysis.

Valuable books of reference are found in the library.

Students taking Qualitative analysis must furnish a deposit of at least five dollars when they begin; those taking quantitative analysis are required to deposit at least seven dollars. Students taking the Course in Chemistry or an extended course in quantitative analysis are expected to provide themselves with a small platinum crucible.

The students, after passing all the required examinations and presenting satisfactory theses upon some chemical subject, graduate with the degree of Bachelor of Science.

Post graduate and special students can make arrangements with the Professor of Chemistry for an advanced or special course of laboratory work and recitations.

TABLE OF HOURS—FIRST TERM.

	SENIORS.	JUNIORS.	SOPHOMORES.	FRESHMEN.
7.30 A. M.	Chapel Services.	Chapel Services.	Chapel Services.	Chapel Services.
7.45 A. M.	History of Civilization, I, IV, V. Civil Engineering, II.	German, I, II, IV, V. Kinematics, III.	General Chemistry.	Geometry.
8.40 A. M.	Stock Feeding and Dairy Farming, I. Advanced Chemistry, IV. Practical Astronomy, II, III, V.	English and American Literature, I, IV, V. Calculus, II, III.	Botany, I, IV, V. Descriptive Geometry, II, III.	
9.35 A. M.	Stereotomy (F. of T.), II. Sanitary Engineering (L. of T.), II. Comparative Anatomy, I, IV, V. Steam Engineering, III.	Agricultural Engineering, I. Vise Work, III. Advanced Chemistry, IV.	French.	Rhetoric.
10.30 A. M.	Political Economy.	Agricultural Chemistry, I. Field Book, Road and Railroad Sur- veying, II. Vise Work, III.	Physics.	Physiology.
P. M.	Laboratory and Farm Practice, I. Higher Surveying, II. Designing and Drawing, III. Laboratory Work, IV. German Translations, V. Military Exercises.	Laboratory Work, I, IV. Field Work, II. Machine Drawing, III. Analysis of English Authors and French Translations, V. Military Exercises.	Laboratory Work in Chemistry. Laboratory Work in Botany, I, IV, V. Laboratory Work in Physics. Mechanical Drawing, II. Carpentry, III. Military Exercises.	Labor on Farm. Free-Hand Drawing. Dissecting; two hours per week. Military Exercises.

NOTE.—Roman numerals refer to courses as follows: I, Agriculture; II, Civil Eng.; III, Mech. Eng.; IV, Chemistry; V, Science and Lit.

TABLE OF HOURS—SECOND TERM.

	SENIORS.	JUNIORS.	SOPHOMORES	FRESHMEN.
7.30 A. M.	Chapel Services.	Chapel Services.	Chapel Services.	Chapel Services.
7.45 A. M.	Mineralogy. Geology.	Agricultural Chemistry, etc., I. Calculus(F. of T), II, III. Advanced Chemistry, IV. Descriptive Astronomy. (L of T.) II, IV, V	German, I, II, IV, V. Drawing and Kinematics, III.	
8.40 A. M.	Mental and Moral Science, I, V. Civil Engineering (F. of T.), II. Contracts, Specifications, etc., II. Wood Turning, III. Laboratory Work, IV.	Logic.	Qualitative Analysis. Analytical Geometry, II, III.	Botany.
9.35 A.M.	Stock Breeding and Veterinary Science and Cultivation of Cereals, I. Steam Engineering & Hydraulics, III. Laboratory work, IV.	Zoology and Entomology, I, IV, V. Applied Mechanics (F. of T.), II. Graphic Statics (L of T.), II. Elements of Mechanism (F. of T.), III. Link and Valve Motion (L. of T.), III	Qualitative Analysis.	French.
10.30 A.M.	U. S. Constitution.	Zoology and Entomology, I, IV, V. Mechanics and Machine Design, III.	Physics (F. of T.) Surveying, (L. of T.) English History (L. of T.), for ladies.	Logarithms and Trigonometry.
P. M.	Thesis and Laboratory Work, I. Designing and Thesis Work, II. Machine Drawing and Thesis Work, III. Laboratory Work, IV. Theme and Thesis Work, V. Military Exercises.	Laboratory and Garden Practice, I. Isometric and Cabinet Projection, and Perspective, II. Drawing, III. Laboratory Work, I, IV. German Translations, V. Military Exercises.	Forge Work, I, III. Field Work, I, II, IV, V. Laboratory Physics. French Translations, V. Military Exercises.	Labor on Farm. Mechanical Drawing. (F. of T.) Laboratory Work in Botany. (L of T) Military Exercises.

LABOR.

It is a characteristic feature of the college, that it makes provision for labor, thus combining practice with theory, manual labor with scientific culture.

The maximum time of required labor is three hours a day for five days in the week.

The larger part of the labor is educational, and for such labor no compensation in money is made. Students in the lowest class perform non-educational labor when required by the college and receive compensation, according to their industry, faithfulness and efficiency. The maximum price paid is ten cents an hour. In arranging for compensated labor, it should be understood that the college does not engage to furnish opportunities for such labor continuously, but rather as the farm and other interests require.

The students of the three upper classes carry on their principal labor in the laboratory, the drawing-rooms, the workshops, or in the field, and for such labor they receive no pecuniary consideration, since it is of a purely educational character.

MILITARY INSTRUCTION.

Thorough instruction in Military Science is given by an officer detailed by the Secretary of War from the active list, United States Army, and is continued throughout the entire course. All able-bodied male students receive instruction in the school of the soldier, company and battalion drill. Arms and equipments are furnished by the United States Government. The uniform, furnished by students, is a dark blue blouse similar to the regulation blouse of an army officer, but with the State of Maine buttons and gilt braid on cuff, and for officers, the chevrons and shoulder straps of red and gold; the pants of lighter blue; the cap blue with gold wreath ornament. The uniform is required to be worn during military exercises, and it is recommended that it be worn at recitations and at other class and general college exercises.

LOCATIONS.

The college has a pleasant and healthful location, between the villages of Orono and Stillwater, about a mile from each. Stillwater

river, a tributary of the Penobscot, flows in front of the buildings, forming the western boundary of the college farm, and adding much to the beauty of the surrounding scenery.

The Maine Central Railroad, over which trains pass many times each day, has a station at the village of Orono. The college is within nine miles of the city of Bangor, and is consequently easily accessible from all parts of the State.

FARM AND BUILDINGS.

The college farm contains three hundred and seventy acres of land, of high natural productiveness, and of great diversity of soil, and is therefore well adapted to the experimental purposes of the institution.

Oak Hall contains forty-eight rooms, and has connected with it a boarding-house. This and the "White" and "Goddard" houses occupied by student-societies, furnish desirable accommodations for one hundred and twenty-five students.

The laboratory contains two apparatus rooms, a lecture room, a weighing room, a recitation room, and rooms for analytical and other purposes, and is in all respects admirably adapted to the wants of the chemical department.

The shop, built during the summer of 1883, is equipped for instruction in three departments of mechanical work, viz; filing, forging and working in wood.

Coburn Hall is occupied by the departments of Natural History and Agriculture. In addition to the rooms needful for the two departments named, it contains a large audience-room, a commodious room for the College Library, and a room especially arranged for a Physical Laboratory.

The College is furnished with valuable apparatus for the departments of Agriculture, Chemistry, Physics, Civil Engineering and Mechanical Engineering, to which additions are made as the exigencies of the several departments require. Models have been made by instructors and students and others have been purchased that serve for purposes of instruction.

LIBRARY.

The library, of which the nucleus was obtained by the generosity of ex-Governor Coburn, has recently received valuable additions through contributions made by other friends of the college and through purchase. The present number of volumes, about six thousand, is continually receiving accessions of standard works in literature and science. A card-catalogue of all the books has been made, a graduate of the Columbia School of Library Economy has been employed as permanent librarian, and the library has become a most important auxiliary to all departments of instruction.

The following periodicals are supplied by the college to the library : American Journal of Science and Art, Popular Science Monthly, Journal Royal Agricultural Society (England), Journal Franklin Institute, American Engineering Magazine and Railroad Journal, Century Magazine, Atlantic Monthly, Harper's Monthly Magazine, North American Review, Forum, Education, American Machinist, Science, American Naturalist, Botanical Gazette, The Engineer, Agricultural Science, Political Science Quarterly, Engineering News, Electrical Engineering, Garden and Forest, Official Gazette U. S. Patent Office.

READING ROOM.

The reading room is supplied with a number of valuable newspapers and periodicals. Grateful acknowledgment is herewith made for the following papers, generously sent by the proprietors to the college :

American Cultivator, Aroostook Republican, Gospel Banner, Kennebec Journal, Lewiston Journal, Maine Farmer, Maine Industrial Journal, Oxford Democrat, Piscataquis Observer, Portland Transcript, Somerset Reporter, Daily Whig and Courier, Zion's Herald, Bangor Daily Commercial, Farmington Chronicle, Phillips Phonograph, Springvale Advocate, Mount Desert Herald, Eastport Sentinel, Mirror and Farmer, Temperance Record, The Industrialist (Kansas), Old Town Enterprise, Aroostook Herald, Hampden News, Boston Evening Transcript, Bangor Daily News, Morning Star, Rockland Free Press, Rockland Courier Gazette, Aroostook Times, National Farmer, The Farmer's Home, The Star Herald, Rural New Yorker, Home Protector, Household Companion.

The following papers are furnished by subscription, principally by the students :

American Machinist, The Engineer, Cultivator and Country Gentleman, Scientific American Supplement, Eastern Argus (furnished by S. W. Gould), Lewiston Evening Journal, Journal of Education, Sanitary Engineer, Popular Science News, Washington Post, Boston Herald, Portland Express, Boston Record, Portland Daily Press, Weekly Inter Ocean, Harper's Weekly, Science, Puck, Judge.

CABINET.

The natural history collections of the college include about nine hundred named and mounted species of the flowering plants of Maine, the Blake Herbarium consisting of foreign and indigenous phænogams and cryptogams numbering about fourteen thousand specimens, the Ellis collection of North American fungi of twenty-three hundred species, a collection of several hundred specimens of marine algæ and several small miscellaneous collections, a collection of sections of tropical species of wood presented by the Department of Agriculture at Washington, and a similar collection of the United States species from the Census Bureau.

The college also has a working collection of carefully selected forms representing the prominent groups of the animal kingdom ; a large and valuable collection of Maine insects, carefully mounted and authentically named, and a fine collection of marine animals in alcohol, mostly from the coast of Maine, donated to the college by the United States Fish Commissioner. The above collections, together with charts, diagrams, skeletons, models, microscopes and other apparatus for illustrating the studies in natural history, are on exhibition in Coburn Hall.

On exhibition also are a good series of the more common minerals and ores supplemented by a collection presented by the National Museum, a collection of building stones from many of the Maine quarries, and a collection presented by the Smithsonian Institution, together with a series of microscopical sections of building stones, given by G. P. Merrill, M. S., Ph. D. In the same room is exhibited a series of typical fossils which illustrate the various geological horizons, together with a collection of Indian stone implements, and various curiosities presented by the friends of the Institution.

PUBLIC WORSHIP.

All students are required to attend daily prayers at the college, and public worship on the Sabbath at some one of the neighboring churches, unless excused by the President.

YOUNG MEN'S CHRISTIAN ASSOCIATION.

The students of the college maintain an active organization of the Young Men's Christian Association, holding meetings weekly.

Its elevating influence in the college is clearly manifest, especially in the earnest and high moral and Christian life of those who constitute its membership.

EXPENSES.

Tuition is thirty dollars a year, divided equally between the two terms. The cost of material and repair of tools for the course of instruction in the v.ise shop is ten dollars; in the forge shop, nine dollars; in the wood shop, four dollars.

Laboratory expenses are at cost of glassware broken, injury to apparatus, and chemicals used. A deposit of five dollars is required of students entering upon a term's work in Qualitative Analysis, and of seven dollars per term from students in Quantitative Analysis. Room rent is four dollars for the first term and five dollars for the second term of the college year.

Students residing too far from the college to *live* at home are required to room and board at the college, unless special permission to live elsewhere be granted by the President. Students receiving such permission pay room rent and fuel rent as though residing at the college.

Bedding and furniture must be supplied by the students, who also furnish their own lights. Tables, chairs, bedsteads, sinks and husk mattresses can generally be purchased at the college at reduced rates.

The price of board will be at cost, and will be determined from term to term. In the history of the college, the price has ranged between \$2.60 and \$3.12 per week; washing averages not more than sixty cents per dozen.

The warming by steam of single rooms (each suitable for two occupants) has averaged for the past six years about eleven dollars

a room for each term. The expense of heating recitation rooms and rooms for general purposes has been about two dollars a term for each student, and the incidental expenses, including pay for the services of janitor, pay for bringing mail, for cleaning and renovating rooms, for general repairs, &c., have been about three dollars per term for each student.

From the items given, with an allowance of a few dollars a year for necessary text-books, quite an accurate estimate of needful expenses can be made.

The college term bills are payable, one-half at the commencement, and the remainder at or before the close of each term

As security for the payment of college bills, a bond of one hundred and fifty dollars with satisfactory securities is required. A blank form of bond will be given with the ticket of admission.

MEANS OF DEFRAYING EXPENSES.

The terms are so arranged that the long vacation occurs in the winter, that the students may have an opportunity to teach during that time. The summer vacation is in the haying season, when farm labor is most profitable. By availing themselves of the opportunities thus afforded, together with the compensation for labor on the college farm, industrious and economical students can cancel the greater part of their college expenses.

SCHOLARSHIPS.

The trustees make provision for the establishment of free scholarships by the following action :

Voted, That any individual or society paying to the Treasurer a sum not less than seven hundred and fifty dollars, shall be entitled to one perpetual free scholarship in the college.

OFFICERS OF THE ALUMNI ASSOCIATION.

PRESIDENT.

PROF. G. H. HAMLIN, Orono.

RECORDING SECRETARY.

PROF. WALTER FLINT, Orono.

CORRESPONDING SECRETARY.

CHAS. S. BICKFORD, Brunswick.

TREASURER.

PROF. W. H. JORDAN, Orono.

NECROLOGIST.

E. M. BLANDING, Bangor.

CLASS SECRETARIES.

- 1872. E. J. HASKELL, Sacarappa.
- 1873. J. M. OAK, Bangor.
- 1874. W. BALENTINE, Orono.
- 1875. E. F. HITCHINGS., Bucksport.
- 1876. E. M. BLANDING, Bangor.
- 1877. S. W. GOULD, Skowhegan.
- 1878. E. C. WAKKER, Lovell
- 1879. F. E. KIDDER, Denver, Colo.
- 1880. A. H. BROWN, Old Town.
- 1881. C. L. MOOR, Hartland.
- 1882. W. R. HOWARD, Cambridge, Mass.
- 1883. B. W. TAYLOR, Prescott, Arizona.
- 1884. G. H. ALLAN, Portland.
- 1885. J. N. HART, Orono.
- 1886. R. K. JONES, Findlay, Ohio.
- 1887. H. S. WEBB, Orono.
- 1888. T. G. LORD, Skowhegan.
- 1889. F. P. BRIGGS, Orono.
- 1890. G. H. BABB, Lynn, Mass.

GRADUATES.

CLASS OF 1872.

<i>Name and Occupation.</i>	<i>Residence.</i>
Benjamin F. Gould, C. E., Farming and Real Estate,	Holliston, California
George E. Hammond, C. E., Civil Engineer,	Navy Yard, Portsmouth, N. H.
Edwin J. Haskell, B. S., Silk Manufacturer	Saccarappa
Hedde Hilliard, C. E., Civil Engineer	Old Town
Eber D. Thomas, B. S., Civil Engineer	Grand Rapids, Mich.
George O. Weston, B. S., Farmer	Norridgewock

CLASS OF 1873.

Russell W. Eaton, C. E., Agent Cabot Mills	Brunswick
George H. Hamlin, C. E., Professor Civil Engineering,	Maine State College, Orono
Fred W. Holt, C. E. Supt. G. S. R. R	St. George, N. B.
John M. Oak, B. S., Merchant	Bangor
*Charles E. Reed, C. E., Agent Columbia Bridge Co., Dayton, Ohio	
Frank Lamson Scribner, B. S., Professor Botany and Horticulture, and Director Experiment Station, University, Knoxville, Tenn.	
Harvey B. Thayer, B. S., Druggist	Presque Isle

CLASS OF 1874.

William A. Allen, C. E., Chief Engineer, M. C. R. R . . .	Portland
Walter Balentine, M. S., Professor of Agriculture,	State College, Orono
William H. Gerrish, B. S., M. D., Physician	Royalton, Vt.
John I. Gurney, B. S., Florist	Dorchester, Mass.
David R. Hunter, B. S.	Oakland, Cal.
Louise H. Ramsdell, B. S., (Mrs. Milton D. Noyes, Farmer,)	Atkinson

*Deceased.

CLASS OF 1875.

<i>Name and Occupation.</i>	<i>Residence.</i>
Solomon W. Bates, C. E., Solicitor of Patents and Mechanical Engineer, Portland	
Wilbur A. Bumps, C. E., M. D., Physician	Dexter
*Samuel H. Clapp, C. E., Teacher	Danvers, Mass.
Lewis F. Coburn, C. E., Civil Engineer	Crescent City, Cal.
Charles F. Colesworthy, B. S., Merchant	Pendleton, Oregon
*Charles F. Durham, C. E., Teacher	Crescent City, Cal.
Alfred M. Goodale, B. S., Supt. Boston M'fg Co., Waltham, Mass.	
Edson F. Hitchings, C. E., M. S., Instructor Natural Science, E. M. Con. Sem'y, Bucksport	
Whitman H. Jordan, M. S., Director Agricultural Experiment Station, Orono	
Edward D. Mayo, M. E., Mill Furnisher and Draughtsman, Minneapolis, Minn.	
Albert E. Mitchell, M. E., Mechanical Engineer, N. Y. & L. E. & W. R. R., New York City, N. Y.	
Allen G. Mitchell, C. E., Div. Supt. Penn. R. R., Gallitzen, Penn.	
*Fred L. Moore, B. S., Teacher	California
Luther W. Rogers, B. S., Merchant	Waterville
Minott W. Sewall, M. E., with Pneumatic Dynamite Gun Co., New York City.	
George M. Shaw, C. E., Principal of Schools	Oroville, Cal.
Wesley Webb, M. S., Editor Farm and Home	Dover, Del.
*Edgar A. Work, C. E.	U. S. Military Academy

CLASS OF 1876.

Edmund Abbott, B. S., M. D., Physician	Providence, R. I.
Charles P. Allen, B. S., Lawyer and Banker	Presque Isle
Elbridge H. Beckler, C. E., Chief of Construction, Great Northern R. R., Helena, Mon.	
Fred M. Bisbee, C. E. Druggist	Wichita, Kansas
Edward M. Blanding, B. S., Editor Maine Industrial Journal, Bangor	
Charles M. Brainard, B. S., Lumberman	Skowhegan
*George H. Buker, B. S., Apothecary	Presque Isle
Florence H. Cowan, B. S., Teacher	Lynn, Mass.

*Deceased.

<i>Name and Occupation.</i>	<i>Residence.</i>
Oliver Crosby, M. E., Treasurer and Manager, American M'f'g Co.,	St. Paul, Minn.
Vetal Cyr, B. S., Principal Madawaska Training School,	Fort Kent
James E. Dike, C. E., City Engineer and County Surveyor,	Devil's Lake, Dakota
*Willis O. Dike, B. S.	Gotham
Horace M. Estabrooke, M. S., Ass't Prin. Normal School,	Gorham
Arthur M. Farrington, B. S., D. V. S., Ass't U. S. Bureau of Animal Industry,	Washington, D. C.
George O. Foss, C. E., Ass't Engineer, N. P. R. R.,	Livingstone Castle, Mon.
William T. Haines, B. S., L. L. B., Lawyer.....	Waterville
Henry F. Hamilton, B. S., D. D. S., Dentist.....	Boston, Mass.
Newall P. Haskell, B. S., Farmer	Orono
Edward S. How, M. E., Office Light House Board, Treas. Dept.,	Washington, D. C.
Philip W. Hubbard, B. S., Nursery Business.....	Alhambra, Cal.
Samuel M. Jones, M. E., Merchant	Worcester, Mass.
Albert A. Lewis, B. S., Clergyman	Bath
Herbert A. Long, M. E., Farmer..	Roque Island, Machias
Luther R. Lothrop, C. E., Division Engineer N. Pac. & Mon. R. R.,	Helena, Mon.
Nelson H. Martin, B. S., Clerk.	Ft. Fairfield
Charles E. Oak, M. E., Lumberman	Caribou
George D. Parks, C. E., Lawyer and Civil Engineer,	Fort Payne, Ala.
Hayward Pierce, B. S., West Waldo Granite Works. . .	Frankfort
Frank R. Reed, C. E., Carpenter.....	Roxbury
Henry J. Reynolds, B. S., Druggist	Eastport
Charles W. Rogers, M. E., Mechanical Engineer.....	Chicago, Ill.
William L. Stevens, M. E., Commission Merchant, Minneapolis,	Minn.
John H. Williams, B. S., Contractor & Surveyor,	Elk River, Minn.

CLASS OF 1877.

Alvah D. Blackington, C. E., Chief Engineer, Erie & Wyoming R'y,	Dunmore, Pa.
Robert B. Burns, C. E., Resident Engineer, A. & P. R. R., Williams,	Arizona

*Deceased.

<i>Name and Occupation</i>	<i>Residence.</i>
Eugene H. Dakin, B. S., Sec'y and Treas., Industrial Journal,	Bangor
Edward F. Danforth, B. S., Lawyer.	Skowhegan
Augustus J. Elkins, B. M. E., Ass't Manager Flour Mill,	Fergus Falls, Minn.
Alicia T. Emery, B. S.	Orono
Samuel W. Gould, B. S., Lawyer	Skowhegan
*Joseph C. Lunt, B. C. E., Civil Engineer, Mex. C. R. R.,	El Paso, Texas
Fred F. Phillips, B. S., Ins. Agent.	Portland
*Samuel Shaw, B. M. E., Architectural Draughtsman,	Boston, Mass.
Frank P. Stone, B. S., Farmer.	Norway
Thomas J. Stevens, B. M. E., Druggist	Portland
George E. Sturgis, B. C. E., Druggist.	Portland, Oregon
Charles E. Town, B. C. E., U. S. Surveyor.	Helena, Montana
James W. Weeks, B. M. E., Architect.	No. Des Moines, Iowa
Nellie E. Weeks, B. S., (Mrs. Llewellyn Spencer).	Orono
Ivan E. Webster, B. S.	Orono

CLASS OF 1878.

Emma Brown, B. S., Teacher (Mrs. Charles Gilman).	Enfield
Andrew J. Caldwell, B. M. E., Mech. Engineer,	New York City, N. Y.
Cecil C. Chamberlain, B. S., Merchant	Anoka, Minn.
George E. Fernald, B. C. E., Salesman.	Chicago, Ill.
James Heald, B. S., City Engineer.	Seattle, Wash.
John Locke, B. S.	With Maine Central R. R., Portland
Frank J. Oakes, B. C. E., Draughtsman.	Brooklyn, N. Y.
John C. Patterson, B. C. E., Ass't Engineer, N. P. R. R.,	Butte City, Mon.
Winfield E. Tripp, B. C. E., L. L. B., Lawyer	Ashland, Wis.
Edward C. Walker, B. S., Lawyer.	Lovell
Otis C. Webster, B. S., Druggist.	Augusta

CLASS OF 1879.

Harry B. Bean, C. E.	Grafton, Mass.
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*Deceased.

<i>Name and Occupation.</i>	<i>Residence.</i>
Edward J. Blake, C. E., Chief Engineer, C. B. & Q. R.,	Chicago, Ill.
Simon P. Crosby, B. S., Lawyer	St. Paul, Minn.
John D. Cutter, B. S., M. D., Physician	Chicago, Ill.
Wilbur F. Decker, M. E., Mech. Engineer	Minneapolis, Minn.
David A. Decrow, B. C. E., Ass't Sup't and Ass't Engineer,	
Holly M'f'g Company, Lockport, New York	
Willis E. Ferguson, B. S., Farming and Real Estate,	Alhambra, California
Charles W. Gibbs, C. E., Chief Engineer, Silverton R. R.,	Silverton, Col.
Annie M. Gould, B. S., (Mrs. Loomis F. Goodale),	St. Joseph, Mo.
*Nellie M. Holt, B. S., Teacher	Orono
Frank E. Kidder, C. E., Architect	Denver, Colorado
Mark D. Libby, B. C. E., Lawyer	Kingman, Kan.
*Charles S. Loring, B. M. E., Machinist	Lewiston
George P. Merrill, M. S., Ph. D., Curator, Nat. Museum,	Washington, D. C.
John W. Meserve, B. M. E., Chief Draughtsman,	
Yale and Towne M'f'g Co., Stanford, Conn.	
Arthur L. Moore, B. S., Farmer	Waterville
Charles A. Morse, C. E., Div. Engineer, A. T. & S. F. R. R.,	Topeka, Kansas
Fred D. Potter, B. M. E., Engineer and Contractor, New York City	
Alton J. Shaw, B. M. E., Draughtsman, E. P. Allis & Co.,	
Mechanical and Electrical Engineer, Wis.	
Percia A. Vinal, M. S., (Mrs. Albert White)	Orono
George O. Warren, B. S., Farmer	Fryeburg
Herbert Webster, B. S., Nursery Business	Alhambra, Cal.

CLASS OF 1880.

Horace W. Atwood, B. S., D. V. S., Veterinary Surgeon,	Brockton, Mass.
James M. Bartlett, M. S., Analytical Chemist,	
Agricultural Experiment Station, Orono	
Albert H. Brown, B. S., Banker.	Old Town

*Deceased.

<i>Name and Occupation.</i>	<i>Residence.</i>
Marcia Davis, B. S., (Mrs. Joseph D. Stevens)	Denver, Col.
Fred B. Elliot, B. S., Farmer	Bowdoin
Sarah P. Farrington, B. S., (Mrs. George P. Merrill)	Washington, D. C.
Charles W. Fernald, A. S., Merchant and Postmaster, So. Levant	Galveston, Texas
Fred W. Fickett, M. S., Farmer and Lawyer	Wilmington, Del.
George W. Lufkin, B. C. E., Ass't Engineer W. & N. R. R.,	Boston, Mass.
Frank A. Mansfield, M. S., Clergyman	Stillwater
Annie A. Matthews, B. S., Teacher	Napa City, Cal.
Henry W. Murray, B. C. E., Farmer and Teacher,	Barnston,
Franklin R. Patten, C. E., Supt. Iron Works,	Chester County, Pa.
Charles T. Pease, B. S., Division Engineer C. K. & N. R. R.,	Denver, Colorado
James F. Purington, B. S., Clerk, R. P. O.	Bowdoin

CLASS OF 1881.

Henry H. Andrews, M. E., Bank Cashier	Callaway, Neb.
Henry W. Brown, M. S., Instructor Metaphysics, Literary Institute, New Hampton, N. H.	Phoenix, Arizona
Clara L. Buck, B. S., (Mrs. Thomas W. Hine),	Omaha, Nebraska
Fannie E. Colburn, B. S., Teacher, (Mrs. Arthur Fernald),	Experiment Station, University, Champaign, Ill.
Edward H. Farrington, M. S., Agricultural Chemist,	Biology, Yale College, New Haven, Conn.
Oliver C. Farrington, M. S., Assistant, Mineralogy and	Greensburg, Pa.
Charles H. Fogg, B. C. E., Civil Engineer and Lumber Merchant,	Oakdale
Aldana T. Ingalls, B. C. E	St. Paul, Minn.
Robert J. Johnson, B. C. E., City Engineer Dep't.	Augusta
Clara A. Libby, B. S., Millinery and Fancy Goods	Waldoboro
Horace F. McIntire, B. M. E., Millwright	Hartland
Charles L. Moor, B. C. E., Civil Engineer	Stillwater
*Benjamin F. Murray, B. C. E	Stillwater

*Deceased.

<i>Name and Occupation.</i>	<i>Residence.</i>
Edwin W. Osborn, B. C. E., N. Pacific R. R.	St. Paul, Minn.
Oscar L. Pease, B. S., Station Agent So. Pac. R. R.	Gila Bend, Arizona
Harold M. Plaisted, M. E. (M. E., Stevens' Institute also)	With H. A. Toutwin, Patent Expert, Springfield, Ohio
Alice I. Ring, B. S.	Orono
Mary L. Ring, B. S., Teacher	Orono
*Roscoe L. Smith, B. S. Farmer	Lewiston
George W. Sturtevant, B. C. E., Civil Engineer and Contractor, Minneapolis, Minn.	
Frank S. Wade, B. S., M. D., Physician . . .	New Richmond, Wis.
*Walter A. White, B. C. E., L. L. B., Lawyer	Newport
*John B. Wilson, B. S., Medical Student.	Orono
Levi A. Wyman, B. C. E., Lawyer and Civil Engineer. . .	Ellsworth

CLASS OF 1882.

Charles S. Bickford, B. S., Asso. Editor Telegraph,	Brunswick
Jacob L. Boynton, B. S.	Lynn, Mass.
Charles W. Brown, B. M. E., Draughtsman, Patent Office, Washington, D. C.	
Stephen J. Buzzell, B. C. E., Civil Engineer	Argyle
Oscar H. Dunton, B. M. E., Physician	Melrose, Mass.
Walter Flint, M. E., Professor Mech. Engineering, M. S. C.,	Orono
George R. Fuller, B. S., Lawyer	Tremont
Charles C. Garland, B. S., Banker and Dealer in Pine Land, Minneapolis, Minn.	
Joseph F. Gould, B. S., Lawyer.	Old Town.
Thomas W. Hine, B. S., Lawyer and Banker . . .	Phoenix, Arizona
Will R. Howard, B. S., Post Graduate, Harvard College, Cambridge, Mass.	
Alonzo L. Hurd, B. S., Medical Student, University, Burlington, Vt.	
Alfred J. Keith, B. C. E., Civil Engineer.	Old Town
Frank I. Kimball, C. E., Mining Engineer	Greensburg, Pa.
James H. Patten, B. S., M. D., Physician.	Ellsworth
Frederick M. Reed, B. M. E., Draughtsman, B. & S. M'f'g Co., Providence, R. I.	
Gleason C. Snow, B. S., Farmer	North Orrington

*Deceased.

<i>Name and Occupation.</i>	<i>Residence.</i>
Avery P. Starrett, B. S., Farmer.	Warren
Frank H. Todd, B. C. E., City Engineer.	St. Cloud, Minn.
Eben C. Webster, S. S., Lumber Manufacturer.	Orono
Willard A. Wight, B. C. E., Supt. Gas Works.	Trinidad, Col.
Daniel C. Woodward, B. M. E., Draughtsman.	Madison, Wis.

CLASS OF 1883.

James H. Cain, B. S., Time Keeper.	Montague
Jonathan V. Cilley, B. C. E., Inspector General of Railroads, Buenos Ayres, Arg. Rep., S. A.	
Frank E. Emery, B. S., Asst. Prof. of Ag. N. C. College and Agriculturist to Exp't Station, Raleigh, N. C.	
Arthur L. Fernald, B. S., Salesman.	Omaha, Nebraska
Bartholomew P. Kelleher, B. S., M. D., Physician.	Orono
Lucius H. Merrill, B. S., Analytical Chemist, Agricultural Experiment Station, Orono	
Jennie C. Michael, B. S., Teacher	Stillwater
Charles W. Mullen, B. C. E., Civil Engineer.	Old Town
Truman M. Patten, B. C. E., Civil Engineer.	Bruce, Wis.
Harry W. Powers, B. S., Manufacturer	Orono
Charles E. Putnam, B. C. E., Civil Engineer Franklin Park, Boston, Mass.	
Lewis Robinson, Jr., B. M. E., M. D., Farmer.	Hampden
George A. Sutton, B. C. E., Merchant.	Abbot
Levi W. Taylor, M. S., Principal High School and Supt. of Schools, Prescott, Arizona	

CLASS OF 1884.

George H. Allen, B. S., Lawyer	Portland
*Will H. Burleigh, B. C. E.,	Vassalboro
Mary F. Conroy, B. S., Teacher	Brewer
Leslie W. Cutter, B. C. E., Contractor and Builder	Bangor
Harriet C. Fernald, M. S., Librarian State College	Orono
Elmer E. Hatch, B. S., Farmer.	Roseland, Mon.
John E. Hill, B. C. E., Civil Engineer.	Lander, Wyo.
Joseph G. Kelley, C. E., Civil Engineer.	Bar Harbor
Edwin F. Ladd, B. S., Chemist, Experiment Station, Fargo, North Dakota	

<i>Name and Occupation.</i>	<i>Residence.</i>
Clarence S. Lunt, B. C. E., City Editor Commercial	Bangor
Fred L. Stevens, B. S., Medical Student	Temple
William Webber, M. E., Draughtsman, McCormick H. M. Works,	Chicago, Ill.

CLASS OF 1885.

George W. Chamberlain, B. S., Principal Grammar School, Calais	
Asher Dole, B. C. E., Civil Engineer	Superior, Wis.
Orion J. Dutton, B. S., Clerk	Boston, Mass.
Henry T. Fernald, M. S., Professor Natural History,	State College, Pa.
Elmer O. Goodridge, M. E., Engineer Ag. and Mech. Institute,	Hampton, Va.
George L. Hanscom, B. S., Clergyman	Sheldon, Iowa.
James N. Hart, C. E., Professor	Maine State College, Orono
Frank E. Hull, C. E., Civil Engineer	Rockland
Austin H. Keyes, B. C. E., Principal High School,	Stonington, Conn.
William Morey, Jr., B. C. E., Draughtsman, U. S. Signal Office,	Washington, D. C.
Joseph P. Moulton, B. S., Farmer	Springvale
Leonard G. Paine, M. E., Draughtsman, Pratt & Whitney Co.,	Hartford, Conn.
Elmer E. Pennell, B. M. E., Machinist, Locomotive Works,	Providence, R. I.
Louis W. Riggs, B. M. E., Instructor Science and Mathematics,	Highwood, N. J.
Fremont L. Russell, B. S., V. S., Veterinarian to	
Agricultural Experiment Station, Orono	

CLASS OF 1886.

Bert J. Allan, B. C. E., Principal High School	Warren, Mass.
Josiah M. Ayer, B. C. E., Ass't Engineer, Dep't B. & M. R. R.,	Boston, Mass.
George G. Barker, B. M. E., Draughtsman,	McCormick H. M. Co., Chicago, Ill.
George F. Black, C. E., Asst. Engineer, M. C. R. R	Portland

<i>Name and Occupation.</i>	<i>Residence.</i>
John D. Blagden, B. C. E., U. S. Signal Service,	Knott's Island, N. C.
Heywood S. French, C. E., Civil Engineer.	Boston, Mass.
Edwin D. Graves, C. E., Civil Engineer,	With Berlin Iron Bridge Co., E. Berlin, Conn.
Ralph K. Jones, B. S., with Kellogg Seamless Tube Co.,	Findlay, Ohio
Elmer Lenfest, B. C. E., Civil Engineer.	Snohomish, Wash.
James F. Lockwood, M. E., Draughtsman	New York City
George F. Lull, M. S., Chemist, Penobscot Chem. Fibre Co.,	West Great Works
Willis H. Merriam, B. C. E., Lawyer.	Spokane Falls, Wash.
Elmer E. Merritt, M. E., Insurance Agent, ..	Salt Lake City, Utah
Arthur D. Page, B. C. E., Civil Engineer.	St. Cloud, Minn.
Irving B. Ray, B. C. E., Lumberman	Harrington
Sidney S. Twombly, B. S., Student Vet. Medicine, McGill	University, Montreal, Canada

CLASS OF 1887.

John H. Burleigh, B. C. E., Civil Engineer, N. M. R. R.,	Vassalboro'
Luis V. P. Cilley, B. C. E., Government Engineer,	Buenos Ayres, Argentine Republic, S. A.
Bert E. Clark, B. S., Law Student	Bar Harbor
David W. Colby, B. S., Chemist.	New York City, N. Y.
Edwin V. Coffin, B. C. E., Clerk.	Harrington
Alice A. Hicks, B. S., (Mrs. Geo. F. Black)	Portland
James D. Lazell, B. M. E., Engineer.	Roanoke, Va.
Charles A. Mason, B. C. E., Civil Engineer,	King's River, Fresno Co., Cal.
Henry A. McNally, B. C. E., U. S. Signal Service,	Milwaukee, Wis.
Fenton Merrill, B. C. E., Civil Engineer, N. M. R. R.	Orono
Addison R. Saunders, B. M. E., Architect.	Tacoma, Wash.
Cassius A. Sears, B. C. E.	Fort Kent
Charles H. Stevens, B. M. E., Manufacturer. . .	Grand Falls, N. B.
Charles F. Sturtevant, B. C. E., Civil and Hyd. Engineer,	Minneapolis, Minn.

<i>Name and Occupation.</i>	<i>Residence.</i>
Frank E. Trask, C. E., Civil and Hyd. Engineer	Ontario, Cal.
Charles T. Vose, B. C. E., Ass't Engineer, M. C. R. R. . . .	Portland
Howard S. Webb, B. M. E., Instructor in Shop Work,	Maine State College, Orono
John S. Williams, B. S., Lawyer	Guilford

CLASS OF 1888.

Hiram B. Andrews, B. C. E	Boston, Mass.
*George S. Batchelder, B. M. E , Draughtsman	Bangor
Charles D. W. Blanchard, B. C. E., Civil Engineer	Old Town
John R. Boardman, B. S., City Editor,	Kennebec Journal, Augusta
Francis S. Brick, B. S., Principal High School.	Berlin Falls, N. H.
Harry Butler, B. S., Instructor Academy	Hampden
Dudley E. Campbell, B. C. E., Civil Engineer	Brunswick
Fred L. Eastman, B. M. E., with Carbon Coal Co.,	Greensburg, Pa.
Edward H. Ellwell, Jr., B. S., with Transcript.	Portland
William J. Hancock, B. S., Professor Natural Science,	Antioch College, Yellow Springs, Ohio
John W. Hatch, B. S., Instructor at Mech. Institute,	Hampton, Va.
Claude L. Howes, B. M. E., with Thompson Houston	Electric Co., Lynn Mass.
Harry F. Lincoln, B. S., with Thompson Houston Electric Co.,	Washington, D. C.
Thomas G. Lord, B. S., Farmer	Skowhegan
Ralph H. Marsh, B. S., Principal High School	Stillwater
Seymore F. Miller, B. C. E., Ass't Engineer, E. V. & N. R.,	Wauzeka Wis.
William Philbrook, B. C. E., Washburn Shop,	Polytechnic Institute, Worcester, Mass.
Seymour E. Rogers, B. M. E., Draughtsman	Greely, Col.
George S. Seabury, B. M. E. Draughtsman	Bangor
Frank L. Small, B. M. E., Draughtsman, In Charge of	Indian Training Shop, A. & M. Institute, Hampton, Va.
Frank A. Smith, B. C. E., Civil Engineer	St. Cloud, Minn.
Nathaniel E. Wilson, B. S., Chemist.	Bergen Point, N. J.

*Deceased.

CLASS OF 1889.

<i>Name and Occupation.</i>	<i>Residence</i>
Fred. P. Briggs, B. S., Assistant in Natural History,	Maine State College, Orono
Charles G. Cushman, B. M. E., Contractor,	Roanoke, Va.
Joseph W. Edgerly, Jr., B. C. E	Princeton
Jere S. Ferguson, B. S., Medical Student, University of New York	
George G. Freeman, B. S., Law Student	Cherryfield
George M. Gay, B. S., Clerk	Boston, Mass.
Eben R. Haggett, B. S	Newcastle
Nellie L. Leavitt, B. S	Norridgewock
John Reed, B. C. E., N. & W. R. R	Cambria, Va.
Nellie W. Reed, B. S., Teacher	Stillwater
*Fred Stevens, B. M. E	Winter Harbor
Gilbert S. Vickery, B. C. E	Bangor
Mark E. White, B. C. E., Surveyor	Ashland
Mortimer F. Wilson, B. S., Merchant	Orono

CLASS OF 1890.

Frank O. Andrews, B. M. E , Draughtsman.	Chelsea, Mass.
George H. Babb, B. M. E., Draughtsman, Thompson & Houston	
	Electric Co., Lynn, Mass.
John Bird, 2d, B. M. E., Clerk in Bank	Rockland
Ralph H. Blackington, B. S.	Rockland
Hugo Clark, B. C. E., Law Student.	Lincoln
Alphonso J. Coffin, B. S., Chemist.	Philadelphia
Walter E. Croxford, B. M. E., Draughtsman.	Bangor
Fred T. Dow, B. M. E., Engineer	Orono
Albert W. Drew, B. M. E., Draughtsman.	Bath
Harris D. Dunton, B. M. E., Draughtsman,	
	American Manuf., Co., St. Paul, Minn.
Horace P. Farrington, B. M. E.	Cape Elizabeth
George P. Gould, B. S.	Stillwater
Nathan C Grover, B. C. E., Ass't in Civil Engineering,	
	State College, Orono
Allen C. Hardison, B. C. E., Civil Engineer.	Caribou
C. C. Harvey, B. C. E., Engineer Great Northern R. R.,	
	Helena, Montana

<i>Name and Residence.</i>	<i>Occupation.</i>
Samuel H. T. Hayes, B. S., Farmer	Oxford
Everett F. Heath, B. M. E., Principal High School.....	Camden
Edward H. Kelley, B. S., on Editorial Staff, Industrial Journal	Bangor
George E. Keyes, B. M. E., Principal High School.....	Bar Harbor
Hannah E. Leavitt, B. S., (Mrs. Walter Flint)	Orono
Elmer L. Morey, B. C. E., Draughtsman, New Jersey Iron Co ,	Trenton, N. J.
Edmund N. Morrill, B. S., Chemist.....	Canon City, Col.
John W. Owen, Jr., B. C. E., Teacher.....	Saco
John V. Pierce, B. M. E.....	Hudson
William Bridgham Pierce, B. M. E.	Hudson
William Barron Peirce, B. M. E., Draughtsman,	McCormick H. M. Co., Chicago, Ill.
George M. Pillsbury, B. S.....	No. Scarboro'
Fred G. Quincy, B. M. E.; Scaler.	Masardis
Joseph R. Rackliffe, B. C. E., Engineer C. B. & Q. R. R.,	St. Joseph
Paul F. Reed, B. C. E.....	Boothbay
Frank W. Sawyer, B. S., Medical Student.....	Old Town
Clarence B. Swan, B. M. E... ..	Old Town
Chester J. Wallace, B. C. E.....	Jackson
Winfield S. Webb, B. C. E	Caribou
Ralph H. Wight, B. C. E., Engineer, Mil. & Northern R. R.,	Iron Mountain, Minn.
Charles S. Williams, B. S. Principal Light Keeper,	Halfway Rock, Portland

NON-GRADUATES.

Average period of attendance, one and a half years.

Present residence not being known, the former residence is given.

Special students are marked in the classes with which they principally recited.

[Corrections for a revised list are solicited.]

CLASS OF 1872.

<i>Name and Occupation.</i>	<i>Residence.</i>
John T. Bowler, Register of Deeds.....	Bangor
William H. Cary, Jr.....	St. Paul, Minn.
Edward F. Fisher.....	San Diego, Cal.
William H. George, Clergyman ..	Topeka, Kansas
William L. Harlow, Farmer.....	Buckfield
George L. Macomber.....	Durham
Charles C. Norton	Buffalo Meadows, Nevada
William B. Oleson, Clergyman and Principal Training School,	Honolulu, Sandwich Islands
Frank W. Rollins, Teacher	Stillwater, Minn.
Oren S. Sargent, M. D., Physician.....	Lawrence, Mass.
*Marcus P. Shorey	Old Town
Benjamin F. Watson, Farmer.....	Levant

CLASS of 1873.

William H. Claffin, Merchant.....	Boston
Joseph E. P. Clark, Book Business.....	Minneapolis, Minn.
*John Jackson.....	Alfred
Samuel Lane, Insurance Agent	Houlton

*Deceased.

<i>Name and Occupation.</i>	<i>Residence.</i>
Wilbur F. Lovejoy, Book-Keeper	Winn
Thomas P. Pease	Bridgton
Clarence Pullen, on Editorial Staff, Harper's Weekly, New York City, N. Y.	
Frederic A. Ransom	Augusta

CLASS OF 1874.

Frank P. Burleigh	Springfield
*Mark E. Burnham	Garland
Louville Curtis	Bowdoinham
*Roland Curtis, M. D., Physician.....	Bowdoinham
*Samuel C. Moore	Cherryfield
Charles F. Osgood, Farmer	Garland
*William H. Reed	Springfield
George I. Trickey, Lawyer	Caribou
Manley H. Whitehouse	Orrington
Edward R. Wingate, Lumber Business	Cherryfield
William I. Wood, Lawyer	Corinna

CLASS OF 1875.

Gustavus Bellows, Farmer; Specialty, Fruit	Freedom
Leander H. Blossom, Farmer	Turner
John H. Carver, Clerk	Boston, Mass.
William B. Dole, Mechanic	Bangor
George N. Gage, Physician	E. Washington, N. H.
Benson H. Ham, Merchant.....	Charleston
Alton A. Jackson, M. D., Physician.....	E. Jefferson
Manley Jackson, Organ and Sewing Machine Business ...	Jefferson
Freeland Jones, Merchant and Surveyor.....	Caribou
Ora Oak.....	Caribou
Sidney S. Soule, Farmer	Freeport
Louis C. Southard, Lawyer, Boston.....	
	Residence, North Easton, Mass.
*George W. Spratt, Merchant	Bangor
Charles H. Spring, Wool Grower, Buenos Ayres, Arg. Rep., S. A.	

*Deceased.

CLASS OF 1876.

<i>Name and Occupation.</i>	<i>Residence.</i>
Francis H. Bacon, Architect	Boston, Mass.
Russell A. Carver	Dixfield
Frank P. Gurney, Farmer	Dover, Dakota
*Frank A. Hazeltine, Farmer	Dexter
Eugene L. Hopkins	Old Town
James W. Linnell, Farmer	Exeter
George J. Moody, Lawyer	Montesano, Wash.
Webster Mudgett	Albion
Edward B. Pillsbury, Manager Postal Tel. Co.	Boston, Mass.
Randall H. Rines, Merchant, (Rines Brothers)	Portland
Walter F. Robinson, Signal Service	Washington, D. C.
Edward C. Shaw, with American Watch Co.	Waltham, Mass.
Frank E. Southard, Lawyer	Augusta
Frank P. Whitaker, Physician	Hermon

CLASS OF 1877.

Charles F. Andrews	Biddeford
Fred S. Bunker, (A. B., Harvard) ..	City Hospital, Boston, Mass.
*Edson C. Chase	Stillwater
William W. Dow, Printer	Rehoboth, Mass.
James T. Emery	Stillwater
Charles M. Freeman	Portland
*Frank H. Goud, Clerk	Fort Fairfield
Austin I. Harvey, M. D., Physician	Newport
Menzies F. Herring, Editor and Publisher	Dexter
Ardean Lovejoy	Orono
Fred B. Mallett, Lumbering Business.	Minneapolis, Minn.
Fred L. Partridge	Stockton
Fred H. Pullen	Foxcroft
*Frank E. Reed	Springfield
Woodbury D. Roberts, Merchant	Cheney, Wyoming
Thomas B. Seavy, Clerk	Chicago, Ill.
Henry C. Townsend, Farmer	Fort Fairfield
Clara E. Webb, Teacher	Unity
Fred S. Wiggin, Farmer	Presque Isle
William B. Whitney	Iowa

*Deceased.

CLASS OF 1878.

<i>Name and Occupation.</i>	<i>Residence.</i>
Charles H. Benjamin, M. E., Professor Mech. Engineering, Case School of Applied Science, Cleveland, Ohio	
Eugene M. Berry	Sumner
*Nathaniel A. Crocker	W. Enfield
Charles C. Elwell, C. E., (1890) Ass't Engineer, W. & N. R. R., Wilmington, Del.	
Howard H. Hartwell	Vinalhaven
John E. Haynes, Jeweler	Old Town
Fred H. Hinckley, Clerk in U. S. Land Office	Eureka, Nev.
Richard S. Howe	Fryeburg
Samuel C. Jameson, Merchant	Providence, R. I.
William S. Jameson, Dealer in Sugar Machinery, Guadalajara, Mex.	
Edgar H. Lancaster, Mechanic in R. R. Shop	Old Town
*Alvra W. Leathers	Dover
James Lunt	Bangor
Herbert A. Mallett, Lumberman	Stillwater, Minn.
Silas H. Miller, Prospecting for Gold and Silver, Fairplay, Colorado	
Frank J. Perkins, Merchant	Old Town
Charles F. Plumly, Merchant	Lincoln
John O. Richardson, Merchant	Old Town
A. Judson Small	No. Lubec
Albert H. Stewart, Piano Regulator	Boston, Mass.
Edson Warriner, Watchmaker and Jeweler	Fryeburg
Erastus G. Weeks, Merchant	Jefferson

CLASS OF 1879.

Daniel Allison	Linneus
Arthur P. Brown, Principal High School	Bradley
Benjamin V. Carver, Machinist	Hartford, Conn.
Frank Clergue, Lawyer	Bangor
Byron H. Cochrane	Woonsocket, R. I.
Fred A. Colburn, Clerk and Scaler	Stillwater, Minn.
James W. Cousens, Merchant and Postmaster	Stillwater
John A. Curtis, Civil Engineer	Delta, Col.
George A. Dustin, Machinist and Trader	Dexter

*Deceased.

<i>Name and Occupation.</i>	<i>Residence.</i>
Loomis F. Goodale, Chief Engineer H. & St. J. R. R.,	Hannibal, Mo.
Edwin A. Hawes, Mechanic	Ontario, Cal.
*Edwin C. Johnson	Gorham
John N. Knapp	Bradley
Oliver S. Jones, Farmer	Corinna
Albert Y. Merrill, Lawyer, Judge of Probate	Aitkin, Minn.
Asa C. Morton, Clerk	Bangor
Harry W. Peakes, Merchant	Charleston
David S. Plummer, Book-Keeper	Boston, Mass.
*Eugene G. Smith	Richmond
William N. Titus, Lawyer, Boston	Residence, Woburn, Mass.
Howard E. Webster, Lumberman	Orono
Arthur L. Wellington, Shipping Agent	Detroit, Mich.
Charles M. Wilson	San Francisco, Cal.

CLASS OF 1880.

Charles M. Allen, Teacher Pratt Institute	Brooklyn, N. Y.
Edwin N. Atwood	Portland
Granville Austin, Salesman	Boston, Mass.
Sylvester A. Brown, Clerk	Boston, Mass.
*Ada M. L. Buswell, Teacher	Minneapolis, Minn.
Charles E. Cheney, Farmer	W. Scarboro'
Woodbury F. Cleveland, M. D., Physician	Eastport
Samuel H. Dyer	Yarmouth
Osgood E. Fuller, Druggist	Albany, N. Y.
Harry H. Goodwin, Editor	Denison, Tex.
John B. Horton, Book-Keeper	Sandusky, Ohio
Daniel S. Jones, Watchmaker and Jeweler	Kansas
*Charles W. Nash	Addison
Willis L. Oak, Clerk	Presque Isle
Fred W. Powers, Farmer and Teacher	Fryeburg
Emily I. Ramsdell, at Marston's Studio	Bangor
*Mortier C. Randall	Stillwater
William J. Rich, Chemist, Cambria Iron Co.	Johnstown, Pa.
Charles S. Simpson, Civil Engineer and County Surveyor,	Florence, Wis.

<i>Name and Occupation.</i>	<i>Residence.</i>
Frank A. Spratt, A. B., Principal High School	Dexter
Daniel Webster, Express Agent	Bangor
Arthur Wentworth	Orrington

CLASS OF 1881.

Henry W. Adams, Lumberman	Wisconsin
*Lorin T. Boynton	Ashland
Charles P. Chandler, Machinist	New Gloucester
*Frank P. Fessenden	South Bridgton
Archy S. Gee, Clerk	Minneapolis, Minn.
George W. Holmes, Merchant	Norway
John F. Horne, Shoe Manufacturer	Auburn
Benjamin L. Johnson	Portland
Edward C. Luques, Broker	Biddeford
Charles S. Macomber, Lawyer	Carrollton, Iowa
Charles S. D. Nichols, Farmer	Hollis
James M. Nowland, Teacher	Woburn, Mass.
Charles C. Ross, Commercial Salesman	St. Stephen, N. B.
Clara Southard, (Mrs. Hammond)	Lincoln Center
*Charles P. Tidd, Tel. Operator	Forrest Green, Missouri
Harry P. Tidd, Teacher	Higginsville, Missouri
William R. Tilden, Workman in Shoe Factory	Campello, Mass.
William A. Vinal, Scaler	Orono
William G. Wales	Monticello, Iowa
Frank B. Weeks, Government Quartermaster's Office, San Francisco, Cal.	
Flora Welch, Nurse	Boston, Mass.
George H. Wilson, Clerk, Gov. Storehouse	Maricopa, Arizona

CLASS OF 1882.

Joseph B. Bartlett, Farmer	Ashland
Charles E. Chapin, Salesman	Boston, Mass.
Charles C. Dunn, Farmer	Ashland
Charles W. Fenlason	Bridgewater
*John J. Greenlaw, Merchant	No. Fryeburg
William H. Hatch, Grocer	Lisbon
Wesley J. Jameson, Clerk	St. Paul, Minn.

*Deceased.

<i>Name and Occupation.</i>	<i>Residence.</i>
Frederick A. Kenniston, Salesman	Brockton, Mass.
Frederick O. Kent	Bremen
Walter H. Nason, M. D., Physician	Hampden
Atta L. Nutter, Teacher	Wilmington, N. C.
Parker J. Page	Orono
Henry K. Poole	Bremen
Louis K. Tilley, Farmer	Castle Hill

CLASS OF 1883.

George R. Carrier, Government Clerk	Washington, D. C.
Arthur T. Drummond, Farmer	Sidney
William E. Emery, M. D., Physician	Surry
Norman F. Kelsea, Clerk	Brockton, Mass.
Edwin P. Kendall, Farmer and Miller	Bowdoinham
*Henry W. Longfellow, Clerk	Machias
Charles S. Murray	Stillwater
George A. Rich, A. B., On Editorial Staff, Journal	Boston, Mass.
Everett F. Rich, Clerk, Bangor Savings Bank	Bangor
Ralph Starbird, Lumber Dealer	San Francisco, Cal.
Ralph R. Ulmer, Lawyer and Clerk of Court	Rockland
Frank C. Webster, Clerk, American Express Co	Bangor
Frank G. Webster, Clerk	Bangor
Lewis H. White, M. D., Physician	Lincoln Center

CLASS OF 1884.

Edward S. Abbott, M. D., Physician	Bridgton
Edward M. Bailey, Merchant	Bangor
Joseph B. Bartlett	Nottingham, N. H.
William A. Berry	Hampden
James A. Dunning	Virginia City, Nev.
Freeland Ellis, Mayor	Hillsboro, Dakota
Eugene E. Folsom, Machinist	Stillwater
Evie M. Hamblen, Teacher	Stillwater
Robert S. Leighton	Steuben
*Gilbert Longfellow, Jr	Machias
Cephas R. Moore, Merchant and Postmaster	Anson
William R. Pattangall, Law Student	Pembroke

*Deceased.

<i>Name and Occupation.</i>	<i>Residence.</i>
Robert C. Patterson, Stenographer.....	St. Paul, Minn.
Charles S. Pendleton, Farmer.	Philbrook, Montana
Herbert L. Rich, Ins. Nat. Sci. Laselle Acad'y, . .	Auburndale, Mass.
Flora M. Ricker (Mrs. P. J. Page)	Orono
Warren J. Ridley, Conductor, Street R. R . . .	South Boston, Mass.
Elmer A. Savage.....	Minneapolis, Minn.
Mertie Sawyer.....	Hampden
Charles F. Smith, Prin. High School	Lenox, Mass.
*Horace G. Trueworthy.....	Orono
Jotham Whipple, Jr.....	Solon

CLASS OF 1885.

James W. Bishop, Farmer	Milo
Frederick H. Butler, C. E., (1890) Construction Dep't	Un. Pac. R. R. Cheyenne, Wyo.
John I. Chase, Clerk.....	Los Angeles, Cal.
Harry W. Davis, Banker.	Church's Ferry, No. Dakota
Fred W. Dickerson.....	Belfast
Samuel W. Hill.....	Machias
Willard A. Libby.....	Denver, Col.
*Frank E. Manter	Milo
Dennis D. Merrill, Steam Laundry.....	Auburn
Carl H. Prince, Farmer	Turner
Elisha C. Vose, U. S. Signal Service and Journalist... .	Chicago, Ill.

CLASS OF 1886.

Eugene C. Bartlett, Medical Student	Orono
Charles L. Libby, Supt. Tool Works	Bridgeport, Conn.
Charles H. Merriam, Lawyer	Spokane Falls, Washington
Dudley W. Moor, Jr., Real Estate	Toledo, Ohio
Harry E. Powers, Mechanic, Iron Works	Bath
Harold E. Trueworthy, Farmer.....	Houlton

CLASS OF 1887.

Alton D. Adams, with Mather Electric Co....	St. Paul, Minn.
John W. Allen	Presque Isle
Alice Benjamin.....	Oakland

*Deceased.

<i>Name and Occupation.</i>	<i>Residence.</i>
Irving M. Clark, Civil Engineer	Seattle, Wash.
Jennie L. Dority	Wells
Wm. J. Harris	Groton, Mass.
Austin D. Houghton, Instructor Clark Institute	Atlanta Ga.
James S. Kennedy	Ludlow
William L. Perham	Paris
Wm. P. Sherburn	Dover
Frank L. Tucker	Norway
Charles W. Wentworth, Lawyer	No. Windham
Rodney A. B. Young, Medical Student	Baltimore, Md.
Alfred S. Ruth, Resident Engineer, P. S. & G. H. R. R.,	Summit, Wash.

CLASS OF 1888.

Charles W. Breed, Clerk	Philadelphia, Pa.
Albion H. Buker	Boston, Mass.
James K. Chamberlain, Plumber and Sanitary Engineer ...	Bangor
*Frank P. Collins	Ft. Fairfield
Fred T. Drew	Orono
George K. Hagerthy	So. Hancock
Fred H. Kirkpatrick, Engineer Quebec Cen. R. R., Sherbrook, P. Q.	
Edwin B. Lord	Stillwater
Alphonso F. Marsh, Druggist	Old Town
Frank J. Page	Orono
Henry F. Perkins, Mechanic	Oakland
Nathan A. Ring, Manufacturer	Orono
Charles C. Rolfe, Teacher	Presque Isle
Abram W. Sargent	Seattle, Wash.
Joseph S. True, Farmer	New Gloucester
Ernest H. Turnbull	St. John, N. B.

CLASS OF 1889.

Benjamin R. Clark	No. Lubec
George G. Fernald	Wilton
Arthur M. Folsom	Old Town
Charles B. Gould	Orono
Elmer E. Greenwood, Norfolk & Western R. R., Big Springs, Va.	
Temple Grosvenor	Canterbury, N. B.

*Deceased.

<i>Name and Occupation.</i>	<i>Residence.</i>
Lewis F. Johnson	Lagrange
Cora A. Leavitt (Mrs. Frank L. Parker)	Norridgewock
John E. Littlefield, Book-keeper.....	Bangor
Albert L. Lyford, Prin. Com. Dept., Maine Wesleyan Seminary,	Kent's Hill
*Maude A. Matthews.....	Stillwater
Clara Rogers, Teacher.....	Hampden
William H. Sargent, Book-keeper.....	Brewer Village
Frederick L. Thompson, Medical Student	Augusta
Norman Tripp	Unity
Fred H. Webb, Mechanical Engineer.....	Skowhegan
Ambrose H. White, Trenton Iron Company	Trenton, N. J.

CLASS OF 1890.

George I. Bowden	So. Penobscot
Carroll D. Cargill	Livermore Falls
Charles A. Dillingham.....	Old Town
Allie M. Hastings.....	Rockland
George W. Hodgdon.....	Rumford
Leon H. Jones, Draughtsman	Boston, Mass.
Irving C. Kenniston.....	Boothbay.
John W. Lewis.....	Milton Mills, N. H.
Herbert B. Rowell, Electrician.....	Pueblo, Col.
Gilman H. Webber, Book-keeper	Boston, Mass.

CLASS OF 1891.

Arthur W. Andrews	Biddeford
Leslie A. Boadway.....	Orono
Henry E. Fernald	So. Levant
Robert W. Fuller.....	Newtonville, Mass.
William A. Harlow.....	Milford
Edwin W. Hodgdon, Clerk	Pittsfield
Byron C. Hodgkins, Clerk	Stillwater
Joseph M. Jackson.....	Boothbay
Charles H. Maling.....	Brewer
William A. Morris	Bangor
Jay P. Norton	York Corner

*Deceased.

<i>Name and Occupation.</i>	<i>Residence.</i>
Arthur M. Otis.....	Grafton
Robert M. Packard.....	Rockland
Clifford I. Pillsbury.....	Rockland
Alden P. Webster.....	Orono

CLASS OF 1892.

George A. Bailey.....	Dexter
Bertrand J. Clergue.....	Bangor
Edwin T. Clifford.....	Leeds
George C. Hamilton..	Dexter
Ernest S. Hatch.....	Lovell Centre
Jacob F. Hersey.....	Patten
Harry S. Thompson.....	Dexter

CALENDAR.

- 1891—Feb. 3, Tuesday, Second Term commences.
June 18, 19, Thursday and Friday, Examinations.
“ 20, Saturday, Prize Declamations by Sophomores.
“ 21, Sunday, Baccalaureate Address.
“ 22, Monday, Prize Essays by Juniors.
“ 24, Wednesday, Commencement.
“ 26, Friday, Examination of Candidates for Admission.
Vacation of five weeks.
Aug. 4, Tuesday, Examination of Candidates for Admission.
First Term commences.
Nov. 23, 24, Monday and Tuesday, Examinations.
Vacation of eleven weeks.
1892—Feb. 2, Tuesday, Second Term commences.

THE
LAND MAMMALS

OF

New England

A THESIS FOR AN ADVANCED DEGREE

BY

ALICE A. HICKS, B. S. (MRS. GEORGE F. BLACK)

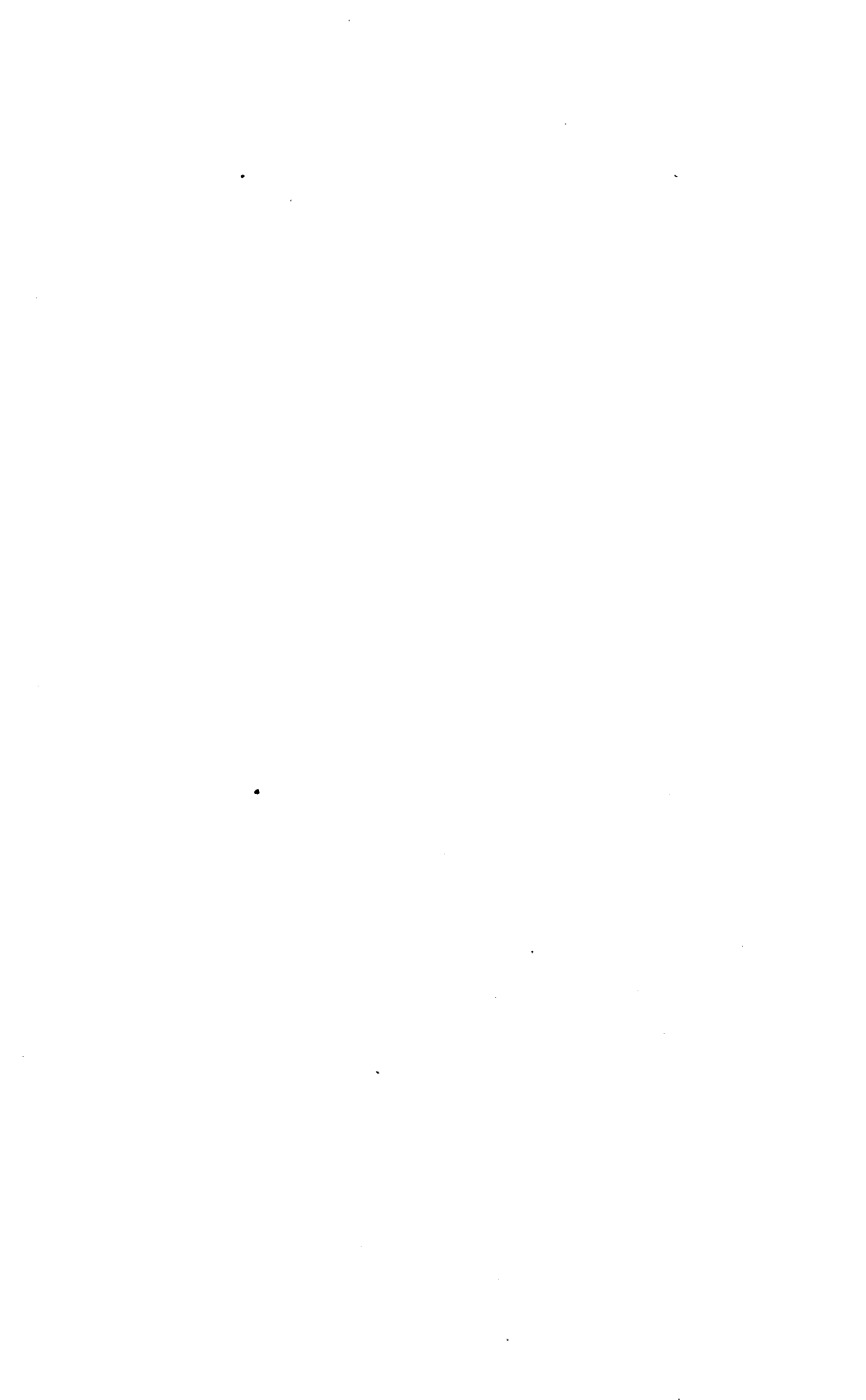
MAINE STATE COLLEGE, '87.

Portland, Me., December, 1890.

AUGUSTA :

BURLEIGH & FLYNT, PRINTERS TO THE STATE.

1891.



INTRODUCTION.

The object of this paper is to give a resumé of the land mammals of New England, exclusive of the domestic animals, together with numerous unpublished notes from various sources.

For the preparation of this work studies were made of the mammals in the cabinets of the Maine State College, the Portland Society of Natural History, the Museum of Comparative Zoology in Cambridge, the Boston Society of Natural History, the Appleton Cabinet of Amherst College and the Massachusetts State Collection at the Massachusetts Agricultural College.

In nomenclature, the trinomial system has been adopted, and the various rules laid down in the Code of the American Ornithologists' Union, have been followed, since, as I have been informed they have been adopted by nearly all American zoologists.

The rule now in general use has been followed of commencing each generic name with a capital letter and each specific and sub-specific name with a lower case letter. All the common names so far as I can find them, have been given to each species; and for convenience of reference an index of the common and scientific names has been added.

I take this opportunity to express my sincere thanks to Prof. F. L. Harvey of the Maine State College, and Mr. C. B. Fuller of the Portland Society of Natural History, for valuable hints and references to useful books; to Prof. Fletcher, librarian of Amherst College and Pres. H. H. Goodell, librarian of the Massachusetts Agricultural College, for use of the libraries under their charge; to Mr. John Littlefield of Hampden, Me., a keen observer of nature, for much valuable information on the habits of animals; and finally to Prof. C. H. Fernald, more than to all others, for, with his usual generosity, he placed his private library at my disposal, gained access for me to the various Massachusetts collections named above and rendered much assistance in the preparation of this paper. In fact without his assistance it would not have been undertaken. I am also under obligations to Mrs. Tenney for permission to use illustrations from Tenney's Zoology.

Class MAMMALIA.

The animals belonging to this class are characterized by having the body more or less covered with hair; the thorax and abdomen separated by a perfect muscular partition (diaphragm); the red corpuscles circular in outline and concave on each side; the occipital bone with two protuberances (condyles) for the articulation of the first vertebra (atlas), and by the possession in the female, of glands which secrete milk for the nourishment of the young.

SYNOPSIS OF THE ORDERS.

1	{ Feet with hoofs	UNGULATA.
	{ Feet with claws.....	2
2	{ Legs adapted for flight.....	CHIROPTERA.
	{ Legs not adapted for flight.....	3
3	{ Incisors adapted for gnawing; canines absent ...	RODENTIA.
	{ Incisors not adapted for gnawing; canines present	4
4	{ Six incisors in each jaw, the lateral ones longest...	CARNIVORA.
	{ Six, or less incisors in each jaw, the lateral ones not longest.....	INSECTIVORA.

Order RODENTIA (Rats, mice, squirrels, &c).

The animals of this order have two well developed, chisel-shaped incisors in each jaw, (four in the upper jaw of rabbits) which have the enamel on the front side and they continue to grow throughout the life of the animal. They have no canines but there is a wide space between the incisors and molars. They are mostly vegetable feeders though a few are omniverous; all except the rabbits can use the fore feet to carry food to the mouth. Some of the species hibernate during the winter.

SYNOPSIS OF THE FAMILIES

1	{ Tail very short	LEPORIDAE.
	{ Tail well developed.....	2
2	{ Body more or less covered with spines	HYSTRICIDAE.
	{ Body without spines	3
3	{ Tail scaly, broad and flattened	CASTORIDAE.
	{ Tail not scaly, broad and flattened.....	4
4	{ Tail long and very hairy	SCIURIDAE.
	{ Tail sparingly hairy	5
5	{ Tail and hind legs unusually long	ZAPODIDAE.
	{ Tail and hind legs not unusually long	MURIDAE.

Family LEPORIDAE (Rabbits or Hares).

The animals of this family have one pair of incisors in the lower jaw and two pairs above, the second pair being small and placed immediately behind the others.

The term rabbit is not correctly used in this country. It is a term which can be properly applied only to the *Lepus cuniculus* of Europe, while the name "hare" is a generic term, as stated by Mr. J. A. Allen, which may be applied to any species of the genus *Lepus*. The term "rabbit" however, is now so generally used for all our species that it will not be likely to be superseded by the more correct term "hare."

Genus LEPUS. Linn.

Hind legs much longer and more powerful than the fore legs; ears large; tail short, bushy and erect.

SYNOPSIS OF THE SPECIES.

Hind feet longer than head. *L. americanus virginianus*.

Hind feet not longer than head. *L. sylvaticus sylvaticus*.

1. LEPUS AMERICANUS VIRGINIANUS. (Allen).

Rabbit, White Rabbit, Southern varying Hare, Northern Hare, American Hare.

Head short; eyes large; ears long, shorter than head; body long and covered with fur; feet with long sharp nails concealed by hair; soles covered with hair; length of head and body about twenty inches; tail two inches. Color in summer reddish brown above, white beneath; in winter the base of the hair is bluish, the middle fawn colored and the tips white. Common throughout New England.

This animal feeds in summer on various kinds of juicy grasses and the bark, leaves and buds of small shrubs and also on garden vegetables. In winter it feeds on the bark and buds of birch, poplar and young pines. It usually remains concealed during the day under low hanging boughs of evergreens, and ventures out to feed by night, or in the morning and evening. Its nest is made beneath low boughs, stumps or hedges. It produces from four to six young in May. The young are covered with short hair and have their eyes open. When caught or wounded the rabbit frequently utters piteous

cries. It travels in paths and is caught in snares and its flesh used as food. The skin has some commercial value though ranked among the cheaper furs. The rabbit has many natural enemies among which may be named the lynx, fox, weasel, mink, eagle and hawk.

2. *LEPUS SYLVATICUS SYLVATICUS*. (Allen).

Gray Rabbit, Wood Rabbit, Wood Hare.

This species is 15 inches long including the head and body, and the tail is 2 inches; color, grayish fawn, varied with brown above and whitish beneath. Its color does not change in winter. Common in Massachusetts and southward.

This species feeds much the same as the white rabbit and is nocturnal in its habits, though it is frequently seen abroad in the daytime. It makes its nest in hollow stumps or in burrows in the ground which have been made by woodchucks or skunks. The nests are of soft leaves and grasses, well lined with fur from the animal's body. The gray rabbit produces from four to six young. Like the white rabbit it has many natural enemies, also has the habit of stamping with its hind feet when alarmed.

Family HYSTRICIDAE (Porcupines).

Body covered with hair and sharp rigid spines.

Genus *ERETHIZON*. F. Cuv.

Fore feet have four toes, hind feet have five, all armed with strong curved claws; ears short and rounded; eyes small; limbs short and strong; end of nose covered with hair.

3. *ERETHIZON DORSATUS DORSATUS*. (Allen).

Canada Porcupine, Porcupine, Hedgehog.

PLATE IV, FIG. 3.

Body stout and clumsy; total length 35 to 40 inches; feet plantigrade, that is, the whole foot sole is brought to the ground when walking; tail short and thick; upper surface of body covered with long, coarse dark brown hair, mixed with spines or quills; these are one to four inches long pointed at the base and at the sharp

outer end armed with numerous barbs which cause them to work deeper into the flesh when they have entered it; the quills are dark brown at the base, then white, tipped with black; the animal is able to erect its quills at pleasure and they drop out very easily; under surface of body and tail have no spines but are covered with dark brown hair; feet with hair thickly arranged along the sides of the soles. Common throughout New England.

The porcupine easily climbs trees where it feeds upon the leaves of the maple and birch, also upon the inner bark of the poplar and hemlock. It also eats beechnuts and is fond of sweet apples. It often girdles trees and in this way, one has been known to ruin a hundred trees in a winter. It is almost wholly nocturnal and spends most of its time in trees where it may often be found asleep. It makes its nest in a hollow tree where it produces two or more young in April or May, which have no quills, but are covered with hair. It does not hibernate but is more stupid in winter. On account of its spiny coat it has few natural enemies but falls an easy prey to man. It is a great pest to hunters whose dogs generally attack it and become pierced with the quills.

The porcupine is often incorrectly called "hedgehog" which is a smaller animal related to the mole and is not found in America.

Family ZAPODIDAE (Jumping mice).

Posterior part of the body enlarged; hind legs and tail very long; fore legs short; teeth 18.

Genus ZAPUS. Coues.

Fore feet with four toes and a rudimentary thumb; hind feet with five toes. Internal cheek-pouches well developed; soles naked; fur coarse; size small.

4. ZAPUS HUDSONIUS. (Zinn).

Jumping Mouse.

PLATE III, FIG. 3.

Length of head and body 2.8 inches; tail 4.9 inches; color dark reddish brown above, with yellow on the sides and white beneath. Common in New England.

This species feeds upon various seeds, berries, beechnuts, etc. It lives in grain fields, meadows of tall grass and also in woodlands, making its nest in hollow trees and stumps and just beneath the surface of the ground in open fields. The nest is made of fine grass lined with feathers, wool and hair. From two to four young are produced several times a season. The agility of the jumping mouse is marvelous. It clears a distance of five or more feet at a single bound. It hibernates in winter as stated by Prof. Tenney and others.

Family MURIDAE (Rats and mice).

Mostly small animals; hind legs and tail not unusually long; fore legs of the usual size; tail round (flattened in *Fiber*) more or less scaly and sparingly hairy; hind feet with five toes; fore feet with four toes and a rudimentary thumb; teeth 16.

SYNOPSIS OF THE GENERA.

1	{ Tail flattened; hind feet partly webbed	FIBER.
	{ Tail round; hind feet not webbed	2
2	{ Incisors laterally compressed; tail more than half the length of body	3
	{ Incisors as wide as deep; tail less than half the length of body	5
3	{ Dull whitish or ash colored beneath	MUS.
	{ Pure white beneath	4
4	{ Length of head and body over six inches	NEOTOMA.
	{ Length of head and body less than four inches	HESPEROMYS.
5	{ Ears more or less concealed in the fur	ARVICOLA.
	{ Ears visible above the fur	EVOTOMYS.

Genus FIBER. Curvier.

Tail long, flattened, with a few scattering hairs; hind feet partly webbed; fore feet fringed with stiff bristles.

5. FIBER ZIBETHICUS. (Linn).

Muskrat, Musquash.

Body cylindrical, resembling the brown rat; length of head and body 15 inches; tail 10 inches; head, neck, and limbs short; nose blunt; eyes small, nearly concealed in fur; ears small; hind feet turn obliquely inward; color reddish brown above, ashy beneath.

There is an albino of this species in the museum of the Boston Society of Natural History. Common throughout New England.

The muskrat is so called from its strong musk odor. It frequents low ground in the vicinity of water. On land it is slow and awkward, but in water swims and dives with ease. Its knife-blade like tail, being very flexible sideways, acts as a rudder. The muskrat is mostly nocturnal, feeding on the roots of aquatic plants, fresh water clams and fish. Sometimes it enters orchards and eats of the apples that have fallen to the ground. It has also been known to find its way to the farmer's cellar, by way of drains, and feed upon his store of carrots, parsnips, turnips, &c.

In the summer it makes long burrows in the banks of streams with a dry nest at the end. The entrance to the burrow is from beneath the water. The muskrat has from three to seven young three times in course of the summer; when very small they may be seen swimming about with the older ones. In autumn before the shallow lakes and swamps freeze over, it builds a low conical house of grass, roots and mud; the base high enough to raise the interior above the level of the water, the entrance being under water. When the ice forms these huts serve as breathing places; the air entering them from a hole in the top. One hut often contains several of these animals. The muskrat is able to live beneath the ice a long time. It is said to obtain fresh air by placing its nose to the under side of the ice and exhaling its breath, forming a bubble; the air is supposed to be thus purified and is breathed in and out several times.

Muskrats are caught in traps and speared in their houses. Their skins have some commercial value but are ranked among the cheaper furs. They can be easily tamed.

Genus ARVICOLA. Lacepede.

Tail cylindrical, or nearly so; well covered with hair from one-fourth to two-thirds the length of the body; ears orbicular, well developed, but never noticeably overtopping the fur.

SYNOPSIS OF THE SPECIES.

Tail less than one inch in length. *A. pinetorum*.

Tail more than one inch in length. *A. riparius*.

6. ARVICOLA RIPARIUS. Ord.

Meadow Mouse, Field Mouse.

Body stout, broadest across the shoulders; length of head and body 4 inches; tail 2 inches; head large and blunt; eyes small; no visible neck; brownish fawn color above, grayish white beneath. There is an albino in the museum of the Boston Society of Natural History. Common in New England.

These little animals live in meadows and feed principally on roots and grasses. They cut paths through the grass and partially dig along the surface of the earth for a considerable distance. They are both nocturnal and diurnal; do not hibernate but when the fields are covered with snow they follow their summer paths and feed on the roots of grasses. Sometimes during a severe winter when the ground is frozen and there is no warm covering of snow they are obliged to get food elsewhere, and resort to the stems of shrubs and fruit trees from which they gnaw the bark, doing much injury to orchards.

The nests of the meadow mouse are always near the surface; two or three may be found under one stump. Others are placed on the surface concealed by tall grasses. They are composed of leaves and soft grass, are oval in shape with the entrance on the side. These mice produce young three or four times during the summer usually four in number.

7. ARVICOLA PINETORUM. Le C.

Pine Mouse.

Length of head and body 3.2 inches; tail 5 inches; head large; eyes small; nose blunt; fur short and lustrous; color above, brown, lead color beneath. This species is not common in New England. Allen says, "It being a southern species Massachusetts is probably its northern limit."

The food habits of the pine mouse are much the same as other field mice. It avoids low ground, the resort of meadow mice, and prefers drier soil. The nest is usually found underground about one foot from the surface, composed of loose materials collected in its vicinity. This species produces young three or four times during the summer, from three to six in number. Like the meadow mouse it has many natural enemies to diminish its numbers.

The common owl, weasel, ermine and mink prey upon it, and the greedy house cat eagerly devours it when shrews and moles are left dead in the field.

Genus EVOTOMYS. Coues.

Tail less than half the length of the body; ears large, extending above the top of the fur.

8. EVOTOMYS RUTILUS GAPPERI. (Vig.)

Red-backed Mouse, Long-eared Mouse, Wood Mouse.

Length of head and body nearly 4 inches; tail 1.5 inches, nose acute; legs long and slender; color bright chestnut; under surface ashy. This species occurs in Massachusetts and northward.

The wood mouse confines itself to woodlands, is rarely found in meadows. It feeds upon beechnuts, seeds, berries, roots and sometimes in winter upon the bark of shrubs and young trees. It is both nocturnal and diurnal, and usually travels freely over the surface of the ground. The nest is placed in a burrow, or beneath a stump or half-decayed log. From four to five young are born several times during the summer.

Genus MUS. Linn.

Ears oblong or rounded, nearly naked; tail long with distinct scaly rings; upper lip divided; nose acute hairy to the fissure; whiskers in five series; no cheek pouches.

SYNOPSIS OF THE SPECIES.

- | | | | |
|---|---|---|----------------------|
| 1 | } | Length of body less than five inches. | <i>M. musculus.</i> |
| | | Length of body more than five inches. | 2 |
| 2 | } | Grayish brown above. | <i>M. decumanus.</i> |
| | | Bluish black above. | <i>M. rattus.</i> |

9. MUS DECUMANUS. Pallas.

Brown Rat, Norway Rat, Wharf Rat.

Body stout; length of head and body 8 to 10 inches; tail 9 inches; head long; nose less pointed than that of the black rat; eyes large; fur seldom lies smooth; grayish brown above, dull white beneath; feet a dingy white. There are two albinos in the museum of the Boston Society of Natural History and one in the Massachu-

setts State Collection. Common in many parts of New England, especially on the sea coast.

This voracious animal is not a native of this country, but according to Dr. Harlan made its appearance in the United States in 1775. It is highly omniverous; is active both day and night. The nest is found in cellar walls, beneath barns and other out buildings and is made of any available substance as straw, chaff, cotton, papers, &c. It also digs underground channels in which to travel so that neither the house cat nor anything else can catch it, and through which it carries large quantities of vegetables, chiefly potatoes. It cannot be said to lay up a winter store, for they practice their mischievous habits at all times of the year. The brown rat produces young, from ten to twelve in number, several times in a season.

10. *MUS RATTUS*. Linn.

Black Rat.

Length of head and body 6 to 8 inches; tail 7 to 8 inches; head long; nose pointed; body smaller than the brown rat; bluish black above, ashy beneath; turns gray with age. Not as common as the brown rat except in some localities.

This species, once better known than the brown rat was, according to Erxleben, brought to the New World in 1554, but since the introduction of the latter species is rapidly diminishing. The brown rat is its greatest enemy. The habits of the two are very similar.

11. *MUS MUSCULUS*. Linn.

House Mouse.

Body small with slender legs; length of head and body about 3 inches; tail nearly as long; nose sharp; eyes black; ears large; color dusky gray above, ashy beneath. There are some varieties in color and pure albinos occur which are easily bred. Common in New England.

The house mouse is also an introduced species. It lives in houses and outbuildings, in fields and under stacks of grain. It is omniverous and both nocturnal and diurnal. The nest is made of the same materials as that of the brown rat, but not as large. It has young several times in a season from three to nine in number. They are small, naked and of a pinkish color. This species is active at all times of the year and is easily tamed.

Genus HESPEROMYS. Waterhouse.

Form much like the genus *Mus*; tail scantily clothed with hair, not scaly; ears very large; feet and under surface white; cheek pouches present.

12. HESPEROMYS LEUCOPUS. (Raf.)

White-footed Mouse, Deer Mouse.

PLATE III. FIG. 4.

Body of fine proportions; length of head and body 2.4 inches; tail 2.3 inches; head medium; nose sharp; eyes large; general color yellowish brown, white beneath. Common in New England.

This species is found in various places; forests of evergreen and hard wood, open fields and sometimes in houses; feeds upon beech-nuts and grain and lays up a winter store, sometimes as much as four quarts being found in a nest. In captivity it is omnivorous. The nest, usually in a hollow tree or log, is lined with fine moss and dried leaves and is very soft and warm. In southern New England it is said to build outside nests in trees and has been known to occupy the same nest with the flying squirrel. This mouse does not hibernate, but sometimes in winter retires to a warm nest in which it remains torpid during severe weather. It produces three to six young several times during a season; is easily tamed and both it and the house mouse has been known to possess rare vocal powers.

Genus NEOTOMA. Say. & Ord.

Nose pointed and flexible; whiskers very long; eyes large and full; ears very large, orbicular and nearly naked; under part of the body white.

13. NEOTOMA FLORIDANA. (Ord.)

Wood Rat.

This species has a graceful form, bright eyes and soft fur; length of head and body 8 to 9 inches; tail 5 to 6 inches; lead color above mixed with black on the dorsal line, face and sides reddish yellow, white beneath. This species is claimed by Gibbs to occur in Massachusetts and southward.

The wood rat feeds upon acorns, corn, vegetables and any sweet, juicy grain, and is mostly nocturnal. It builds its house in the shape of great heaps of brushwood and other vegetation, several bushels being sometimes heaped up. They are often built in bushes or trees and Audubon says: "These nests in certain situations are of enormous size; we have observed some of them on trees at a height of ten to twenty feet from the ground, where wild vines had made a tangled mass overhead, which appeared to be larger than a cart wheel and contained a mass of leaves and sticks that would have more than filled a barrel." From three to six young are born generally twice a year. The wood rat makes a playful and interesting pet.

Family CASTORIDAE (Beaver).

Aquatic rodents of large size; fore feet with five distinct toes and claws. The incisors are very large and the structure of the skull indicates great gnawing power.

Genus CASTOR. Linn.

A double claw on the second hind toe; hind feet webbed; tail broad, flat and scaly.

14. CASTOR FIBER CANADENSIS. (Kuhl).

Beaver.

PLATE III, FIG 2.

The beaver is a stout, clumsy animal and the largest of the rodents; weight 30 to 45 and even 60 pounds; length of head and body 5 feet; tail 10 inches; nose blunt; eyes small; ears short; fore feet short and slender; hind feet large and webbed beyond the nails; tail covered with angular scales except for one inch from the base it is covered with hair; color, reddish brown varying to a glossy black. The beaver is extinct in New England except in Northern Maine.

It is wholly an aquatic animal and feeds upon the roots of water plants and the bark of soft wooded trees. It is strictly nocturnal and a great worker, showing wonderful ingenuity in constructing its dwellings which are of two kinds, houses and burrows. The houses are built of interlaced sticks mixed with vegetable fibre and mud. It obtains the sticks by cutting down trees with its sharp and pow-

erful incisors and transports the material thus obtained by water to the place of erection.

Some writers claim that their houses have two rooms, one above the other, but Morgan in his book says "I have opened a large number of these lodges in dissimilar situations and never found but one with two chambers and these were upon opposite sides of a fallen tree over which the lodge was constructed." The houses are dome shaped or oblong, built in the water usually a few feet from the shore. The chamber within varies in size. One is described as about six feet across the floor and two feet from the floor to the roof. There are two entrances, the 'wood' entrance and the "beaver" entrance. The former is an inclined plane rising from the bottom of the pond to the chamber and will easily admit all their wood cuttings upon which they feed in winter. The latter is usually abrupt and winding for the exit and return of the beaver. These passages are made with great skill and are from 7 to 12 feet long. The floor of the chamber is always above the water line. In addition to his house the same beaver has burrows in the banks of the stream or pond, the entrance to which is always below the water. They are from 10 to 15 feet in length and are used as places of refuge in time of danger. In order to maintain the water at the required height around his habitations the beaver often constructs dams of sticks and mud which are very ingenious and sometimes quite extensive. L. H. Morgan describes one 260 feet in length.

Beavers are social animals and live in the family relation. The family consists of male, female and young of two years and younger. The female brings forth from two to five at a birth in May so that as many as twelve are sometimes found in one family. When two and a half years old the beaver is full grown and leaves the parents' home. They are said to live from 12 to 15 years. They are easily tamed and their fur is very valuable.

Family SCIURIDAE (Squirrels).

Body generally long, often slender and delicate, but sometimes thick and clumsy; tail long or short, cylindrical and slender, or bushy and flattened, always well covered with hair. In one genus there is a broad densely furred inter-femoral membrane.

SYNOPSIS OF THE GENERA.

- 1 { Sides with a fur covered membrane for flying . . . SCIUROPTERUS.
- { Sides without a membrane for flying 2

2	{	Tail less than half the length of the body... ..	ARCTOMYS.
		Tail more than half the length of the body... ..	3
3	{	Body with longitudinal black stripes... ..	TAMIAS.
		Body without black stripes.....	SCIURUS.

Genus ARCTOMYS. Schreber.

Body large, thick, broad and flattened; cheek pouches small; tail rather short, bushy, not flattened; ears small; fur thick with long coarse hair.

15. ARCTOMYS MONAX. (Linn).

Woodchuck, Ground Hog.

Length of head and body 18 inches; tail 5 to 6 inches; whiskers numerous; hind feet sub-palmated; nails channelled; tail bushy, expanded towards the tip; color brownish-gray above, lighter beneath, with head, tail and feet dark brown. There is a beautiful albino of this species in the Massachusetts State collection. Common throughout New England.

The woodchuck feeds upon grasses and garden vegetables and is especially fond of red clover. It feeds upon all fours but sits erect to chew its food and watch for danger. It makes burrows in the sides of hills which extend to a distance of 20 or 30 feet and end in various chambers according to the number of inhabitants. The chambers are lined with dry grass or leaves and in them they pass the winter in a torpid state, previously closing the entrance. It retires early to its winter quarters in a fat condition and remains until late in the spring and is said to put its paw in its mouth and suck it as is the case with the bear. It produces four to six young in May or June. It feeds both by day and night and in some localities is a great pest to farmers, doing much injury to their field crops and gardens.

Genus TAMIAS. Illiger.

Ears of medium size or small, well clothed but never tufted; cheek-pouches large; tail shorter than the body, flattened and rather broad; fur full and soft with well defined dorsal stripes.

16. TAMIAS STRIATUS. (Linn).

Chipmunk, Chipping Squirrel, Striped Squirrel, Ground Squirrel.

PLATE IV. FIG. 2.

Body slender; length of head and body 6 inches; tail 4 inches, forehead arched; whiskers shorter than head; cheek-pouches extend-

ing on the side of the neck to a little below the ears, opening into the mouth between the incisors and molars; five black and two white stripes on the back, under surface white, forehead and thighs orange, tail grayish black edged with gray, yellowish brown beneath. The color of the chipmunk varies. There are two albinos and one entirely black in the collection of the Boston Society of Natural History. Common throughout New England.

This squirrel makes its burrow near the roots of trees, in the centre of decayed stumps, along fences or old walls or near woods, from which it obtains food, such as nuts, cherry stones, &c. It is diurnal, very active and as soon as the nuts and seeds are ripe provides a plentiful supply of winter food. In November it retires to its winter quarters which it does not leave until spring unless its food supply runs short. It produces four to five young twice each year.

Audubon and Bachman speak of digging out a chipmunk's nest that contained a gill of wheat, about a quart of shelled hazel nuts, nearly a peck of acorns, some grains of Indian corn, about a quart of buckwheat and small quantity of grass seeds. The noise made by this squirrel somewhat resembles the chirp of a chicken. It rarely climbs trees and is not easily tamed.

Genus SCIURUS. Linn.

Size generally large; no cheek-pouches; ears well developed, well clothed, sometimes tufted especially in winter; tail generally as long or longer than the body with broad long hairs spreading laterally.

SYNOPSIS OF THE SPECIES.

Reddish above, white beneath. *S. hudsonius hudsonius*.

Grayish above, white beneath. *S. carolinensis leucotis*.

Grayish above, reddish beneath. *S. niger cinereus*.

17. SCIURUS HUDSONIUS HUDSONIUS. (Allen).

Chickaree, Red Squirrel, Hudson's Bay Squirrel.

Body light and agile; length of head and body about 7 inches; tail 6 inches; forehead arched; nose obtuse; eyes medium size; ears broad, rounded, both sides covered with short hair. In winter the fur projects beyond the margin of the ears resembling tufts;

whiskers longer than head; tail flat somewhat bushy; limbs robust; claws sharp, slightly hooked; color reddish brown above, grayish white beneath; hair of tail so colored as to present a line of black around the outer border. Common throughout New England.

This squirrel is a noisy, chattering animal, is quite fearless and very active and sprightly even during the cold of northern winters. It lays up a large quantity of food for winter use consisting of nuts and grain, which is deposited in hollow trees, beneath logs or in some other secure place. Usually two or more such stores are secured by each family, but should these supplies fail it resorts to the seeds from cones of pine, spruce and fir trees. These squirrels are diurnal, sleeping at night or in hard storms in nests constructed in hollow trees or in the spreading branches of evergreens. These nests are as large as one and a half feet in diameter and are lined with the soft bark of cedar, leaves, &c. The entrance is at the side. From four to seven young are born about the last of May, which are pink colored and quite naked. When driven from the nest containing young, the mother frequently carries her family away in her mouth, one at a time to a place of safety. They have been observed to carry the young by gathering the four feet in the mouth. The red squirrel is easily tamed.

18. *SCIURUS CAROLINENSIS LEUCOTIS.* (Gapper).

Gray Squirrel.

Length 12 inches; tail 13 to 14 inches; body large; ears not tufted but hairs project beyond the margin; color gray above, white beneath, but subject to variations being sometimes black; tail yellowish brown with black annulations, tipped with white. There is an albino of this species in the Appleton Cabinet of Amherst College. Common throughout the greater portion of New England.

This species is one of the most active of the squirrels; it is up with the sun in search of food, scratching among the leaves, running over logs and skipping from bough to bough and from tree to tree. It often jumps from considerable heights unharmed. C. H. Merriam says he has seen one jump from a tree 80 feet from the ground and has seen one fall 100 feet, from a tree covered with ice, and escape uninjured. Its food consists of nuts, corn, grain, seeds and the larvæ of insects. Like the red squirrel it has the curious habit of hiding its food just out of sight beneath the leaves. The

gray squirrel does not lay up a store of food and is active throughout the entire year. The nest is built in the fork of a tree and consists of small branches, twigs, leaves and moss, lined with the inner bark of trees and other soft material; covered at the top; entrance at the side. From three to six young are produced in March or April; they are very small, naked, blind and helpless and remain in the nest about two months. Migrations occur at irregular periods. This squirrel is easily tamed, is fond of music and makes a desirable pet.

19. *SCIURUS NIGER CINEREUS.* (Linn.)

Fox Squirrel.

Length of head and body 12 to 13 inches; tail 11 to 14 inches; color variable with nose and ears never white; tail broad and flat, whitish gray above, yellowish white beneath with edges reddish, varying to dusky above with under surface black. Said to occur in Massachusetts and southward.

This species has many habits in common with other squirrels, but is not active like the gray squirrel. It climbs trees with slowness and reluctance and rarely leaps from bough to bough. It is said to have young but once a year, three to four in number.

Genus *SCIUROPTERUS.* F. Cuvier.

Limbs united by a furred membrane; ears large, sparsely furred; no cheek-pouches; tail very broad; size small.

20. *SCIUROPTERUS VOLUCELLA VOLUCELLA.* (Allen).

Flying Squirrel.

PLATE IV, FIG. 1.

Length of head and body 5 inches; tail 4 inches; head short and rounded with blunt nose; eyes large; ears broad; whiskers numerous; tail flat, rounded at the edges. The flying membrane is extended by the legs, serving as a parachute; when not extended it contracts against the sides and is not noticeable. Fur very fine, soft and silky; claws acute; color ashy brown above tinged with cream color, white beneath. Common in New England.

These animals do not fly as their name suggests, but they climb a tall tree, extend the membrane and descend in a gliding course to

the ground. They never fly upward nor do they move the membrane as a bird does its wings in flight. They cannot run fast and are easily caught if there is no tree near for them to climb; do not bite like other squirrels; wholly nocturnal, feeding upon nuts, seeds, buds, etc. They lay up no winter store but hibernate. They live in communities and make their nest in some natural cavity in the branch or trunk of a tree. This species produces three to six young but once a year. Is easily tamed.

Order INSECTIVORA (Shrews and Moles).

Animals of small size with carnivorous tendencies, feeding upon insects and worms. The head ends in a pointed muzzle which is often elongated like a proboscis. All are plantigrade with naked soles and usually five-toed feet armed with strong claws; dentition complete; canines small and grinders sharp pointed.

SYNOPSIS OF THE FAMILIES.

No external ears; feet large, adapted for digging TALPIDAE.
 External ears developed; feet normal SORICIDAE.

Family SORICIDAE.

The animals of this family are characterized by their general mouse-like appearance; muzzle elongated, tapering; ears distinctly developed; feet normal or not formed for digging.

SYNOPSIS OF THE GENERA.

- 1 { Tail about as long as the body 2
- { Tail about as long as the head BLARINA.
- 2 { Feet well developed with a fringe of bristles NEOSOREX.
- { Feet of moderate size, not fringed SOREX.

Genus BLARINA. Gray.

Ears small, concealed in the fur; tail about as long as head.

21. BLARINA BREVICAUDA. (Say).

Mole Shrew, Short-tailed Shrew.

Length of head and body 3 5 inches; tail 1 inch; head large; eyes very small; fore feet naked; tail thinly covered with hair; fur long; blackish lead color above, a little lighter beneath; feet and nails white. Common in New England.

This common species seeks its food both day and night. It lives upon insects, earth worms, slugs and mice, and spends much of its life under leaves and half decayed logs, roots of trees and stumps. It is active in winter, and has been seen running about over the snow with the temperature —20° Fahrenheit, burrowing down when it comes to an elevation that denotes the presence of a log or stump,

probably to feed upon the larvæ of insects that are usually to be found in such places.

The mole shrew is very greedy, and one writer who had one in confinement states that this little animal ate about twice or three times its own weight of food every twenty-four hours. It is also claimed that in its natural state, in order to satisfy its enormous appetite, the shrew resorts to beechnuts and small seeds for food, which accounts for the sometimes worn condition of its teeth. Shrews are often found dead, it is supposed from starvation. The shrew produces young two or three times in a season, from four to five in number. It is rarely eaten by birds or beasts of prey but is usually left where killed, due to the offensive odor from its scent glands.

Genus NEOSOREX. Baird.

Ears short, vavular; tail as long as head and body; feet well developed, with a fringe of stiff bristles.

22. NEOSOREX PALUSTRIS. (Rich.)

Marsh Shrew.

Body full and stout; length of head and body 2.8 inches; tail 2.8 inches; nose long and rather slender; eyes moderate; ears concealed by the fur; tail covered by short stiff hairs with a distinct pencil at the end; fur close, full and of moderate length; color above, nearly black; under surface, dark lead gray; chin, nearly white; feet and tail black.

The marsh shrew is aquatic in its habits. This northern species has been taken at Franconia, N. H., and Warwick, Mass.

Genus SOREX. Linn.

Ears large, vavular; tail as long as the body; feet moderate not ciliated.

SYNOPSIS OF THE SPECIES.

1	{	Teeth 30.....	<i>S. thompsoni.</i>
		Teeth 32.....	2
2	{	Third and fourth premolars equal.....	<i>S. cooperi.</i>
		Third premolar larger than the fourth..	3
3	{	Color above smoky brown.....	<i>S. fosteri.</i>
		Color above chestnut or dark brown..	<i>S. platyrhinus.</i>

23. SOREX THOMPSONI. Baird.

Thompson's Shrew.

PLATE I, FIG. 2.

Body slender; length of head and body 2 inches; tail 1.2 inches; tail very slender, well furred, ending in a pencil of bristly hairs; color above dark brown, paler on the sides; beneath ashy white.

This rare species has been taken at Waterville and Norway, Maine and at Burlington, Vermont.

24. SOREX COOPERI. Bach.

Cooper's Shrew.

Body very slender; length of head and body about 2 inches; tail nearly 2 inches, well penciled at the tip; eyes distinct; color light chestnut above, paler beneath. Common in various parts of New England.

25. SOREX FOSTERI. Rich.

Foster's Shrew.

Length of head and body 2.7 inches; tail 1.7 inches; tail nearly naked towards the tip, otherwise thinly haired; ears readily visible though not projecting beyond the fur; color above, smoky brown or lead gray, slightly hoary; beneath, pale grayish ash, decidedly lighter than above.

This rare species was taken in the Hudson Bay region by Richardson; New York by Bachman; Carlisle, Pa. by Baird. It has been reported in Mass. by Samuels.

26. SOREX PLATYRHINUS. DeK.

Broad-nosed Shrew.

Length of head and body about 2 inches; tail 1.5 inches; tail scantily provided with hair; color above chestnut, beneath pale ashy. Common throughout New England.

Family TALPIDAE (Moles).

External ears wanting; fore feet greatly expanded and furnished with strong claws adapted for digging; fore limbs larger than the hind limbs; fur compact and velvety.

SYNOPSIS OF THE GENERA.

- | | | | |
|---|---|--|-------------------|
| 1 | } | Nose fringed at the ends with fleshy projections.... | <i>Condylura.</i> |
| | | Nose not fringed | 2 |
| 2 | } | Tail nearly naked | <i>Scalops.</i> |
| | | Tail densely hairy | <i>Scapanus.</i> |

Genus SCALOPS. Carvier.

Nose elongated, not fringed ; nostrils partly superior ; eyes hidden ; tail short, nearly naked ; teeth 36.

27. SCALOPS AQUATICUS. (Linn.)

Common Mole, Shrew Mole.

PLATE I, FIG. 3.

Body cylindrical and thick ; length of head and body 4 inches ; tail 1 inch ; no distinct neck ; nose very flexible extending beyond the incisors ; eyes minute, hidden by the fur ; no external ears ; tail with a few short hairs : color, silver grayish brown ; nose and palms in a living animal, pink flesh color. Common throughout New England.

The common mole spends nearly all of its life underground. It is purely carnivorous, feeding upon earth worms, grubs, ants and other insects, and in eating, employs its flexible nose to thrust food into its mouth. Contrary to what its name implies it avoids the water and prefers dry earth where it burrows in the soil and the rapidity with which it pushes its way through the ground is remarkable. Audubon and Bachman state that "It has been known in a single night to excavate a gallery several hundred yards in length." Referring to this statement Merriam says, "Computation shows that in order to perform equivalent work a man would have to excavate in a single night a tunnel thirty-seven miles long and of sufficient size to easily admit the passage of his body." The burrows are from one to two inches from the surface and at the approach of winter are sunk deeper into the soil and thus the mole with the earth worm, which is then its principal food, avoids the frost of winter. The progress of the animal is easily traced by low ridges of crumbling earth, and in following the galleries one finds a number of little hills of loose earth 4 to 6 inches high, and 8 to 10 inches in diameter. The nest which is made of leaves and soft grass, is from six to eight inches below the surface with passages leading from it in various directions. When the chambers or galleries are injured they are at

once repaired. From five to nine young are born several times in a season. The shrew mole comes regularly to the surface at 12 o'clock. It is regarded an enemy to the farmer for it injures the roots of plants and vegetables by loosening the earth around them while in search of food.

Genus SCAPANUS. Pomel.

Nostrils lateral; tail densely hairy; teeth 44.

28. SCAPANUS AMERICANUS. (Harl).

Hairy-tailed Mole, Brewer's Mole.

Length of head and body about 4 inches; tail 1.5 inches; head longer and narrower than that of the shrew mole, also with claws longer, thinner and sharper; the greatest difference however is in the tail which is flat, broad and thickly clothed with long, stiff hair; color glossy ashy black above, brownish beneath. Common in various parts of New England.

The habits of this mole resemble those of the shrew mole except that its mounds have no chamber and surface opening, and its galleries are made a little deeper. It is not known to indulge in the little "noonday" excursions of the former.

Genus CONDYLURA. Illiger.

Nose elongated and fringed at the end with a circle of long, fleshy projections; nostrils terminal and circular; tail nearly as long as the body and covered with hair; teeth 44.

29. CONDYLURA CRISTATA. (Linn.)

Star-nosed Mole.

PLATE I, FIG. 4.

Body stout, cylindrical, covered with dense fur; length of head and body 5 inches; tail 3 inches; muzzle encircled by a disk of 18 to 20 fibres; neck not visible; fore feet broad with flattened claws; feet naked and of a flesh color; color of fur brownish black. Common throughout New England.

The star-nosed mole is usually found in the neighborhood of streams, and in low ground where it burrows in moist places near the surface, forming elevated ridges like the shrew mole, and chambers for rearing its young, though the excavations are not so extensive and the "mole hills" are larger.

Order CHIROPTERA (Bats).

Mammals with the fore limbs modified for flight by the elongation of the fore arm and the still greater development of four of the fingers, all of which are connected by a membrane which extend to the hind feet. They are also provided with complete dentition, are insectivorous and strictly nocturnal.

Family VESPERTILIONIDAE.

Nostrils sub-elliptical; wing membranes wide; tail enclosed in the interfemoral membrane with the point sometimes extending beyond it.

SYNOPSIS OF THE GENERA.

1	{	Two incisors in the upper jaw	ATALAPHA.
	{	Four incisors in the upper jaw.	2
2	{	Skull not inflated	VESPERUGO.
	{	Skull inflated	VESPERTILIO.

Genus VESPERTILIO. Linn.

Skull inflated, raised above the line of the nasal bones; teeth 38.

30. VESPERTILIO SUBULATUS. Say.

The Little Brown Bat.

Total length 3.2 inches; tail 1 inch; spread 9 inches; face small, fox like, with high forehead and pointed nose; ears large, oval, turned slightly outward; wings naked; interfemoral membrane naked except at the base, including the tail; color olive brown above, grayish beneath. Common throughout New England.

During the day this little bat inhabits hollow logs and trees, barn braces and deserted buildings, where it suspends itself head downwards, holding on by the hinder claws. It hibernates in large numbers in the same situations during the winter. One writer states that from 1,500 to 2,000 were found at one time in a deserted building. It feeds on insects and produces young usually two in number. Though the eyes are small and appear to be nearly sightless, it shows wonderful skill in avoiding objects during its rapid flight.

Genus VESPERUGO. Keys and Blas.

Skull not inflated, scarcely raised above the line of the nasal bones; head flat and broad; lips swollen; teeth from 32 to 36.

SYNOPSIS OF THE SPECIES.

1	{	Hair above black, tipped with white.....	<i>V. noctivagans.</i>	
	{	Hair above reddish, or chestnut brown . . .		2
2	{	Length of head and body, one inch and a half	<i>V. georgianus.</i>	
	{	Length of head and body, two inches and a half.....	<i>V. serotinus fuscus.</i>	

31. VESPERUGO SEROTINUS FUSCUS. (Schreber).

Dusky Bat, Carolina Bat.

Total length 4 inches; tail 1.5 inches; spread 12 inches; ears large, higher than they are broad, more or less turned outward; wings naked; interfemoral membrane furred at the base; face dark brown; body above, light chestnut, a lighter shade beneath; teeth 32. Common in some localities especially in southern New England.

32. VESPERUGO GEORGIANUS. F. Cuv.

Georgian Bat.

Total length about 3 inches; tail 1.5 inches; spread 9 inches; head flat, hairy; sides of face swollen and studded with hair; nose flat, broad, naked; nostrils small; ears nearly naked and straight on the outer border terminating near the mouth in a wart; thumb and feet large; fur thick, long and soft, extending over one-third of the interfemoral membrane; general color reddish or chestnut brown; teeth 34. Rare in New England, chiefly a southern form.

33. VESPERUGO NOCTIVAGANS. (Le C.)

Silver Black Bat. Silver-haired Bat.

Total length 3.5 inches; tail 1.3 inches; spread 10 inches; nose naked; nostrils wide apart; femoral membrane entirely though scantily furred; fur long and silky, black with silvery tips to the hairs giving a powdered aspect; teeth 36. Common throughout New England.

This bat frequents water ways, streams, lakes, ponds, &c., where it often flies about over the surface of the water and has been seen to swim in the water with ease. It also inhabits hard wood groves, and hibernates in hollow trees during the winter and like other species may be found hibernating in large numbers. Hundreds and it is said even thousands have been found in the hollow of a tree. The young, generally two in number, are born about the first of July and commence to fly when three weeks old.

Genus ATALAPHA. Raf.

Head depressed, lips slightly fringed; nostrils wide apart; skull flat and massive; teeth 32.

SYNOPSIS OF THE SPECIES.

Fur russet red *A. noveboracensis*.
 Fur dark tipped with white *A. cinerea*.

34. ATALAPHA NOVEBORACENSIS. (Erxl.)

Red Bat, New York Bat.

Total length about 4 inches; tail nearly 2 inches; spread 10 to 12 inches; ears broad, a few short whiskers on the cheeks; fur long, silky; color reddish brown mostly white at the tips; lips and ears not edged with black; a whitish tuft at the base of thumb. Common throughout New England.

35. ATALAPHA CINEREA. (Beauvois).

Hoary Bat.

PLATE I. FIG. I.

Total length nearly 5 inches; tail 2.2 inches; spread 14 to 15 inches; dentition and other structural characters like the Red Bat; color rich chocolate brown overlaid with white; lips and ears marked with black. Common in various parts of New England.

It is not commonly believed that bats migrate but Dr. Merriam says that "Evidence of migration is complete. The hoary bat belongs to the Canadian fauna, but in fall and winter occurs at places far to the southward of its breeding range. The silver haired bat occurs regularly in spring and fall at a lonely rock about thirty miles off the coast of Maine. No bats breed at this place and the nearest island is fourteen miles distant."

Order UNGULATA (Deer, &c).

Animals of this order have four well developed legs, each furnished with four or less toes each provided with a horny hoof. Of this order only representatives of the group *Ruminantia* occur in New England. The Ruminants have no incisors in the upper jaw and the stomach is divided into four compartments, and as their name indicates, they ruminate their food or chew the cud, and are represented by the family *Cervidae*. Our species are all provided with solid horns (at least the males) which are shed annually.

Family CERVIDAE (Deer, moose, caribou).

These animals are slender in form, with solid deciduous, horns, present in all males, and in the females of some species. They have two well developed, and two rudimentary hoofs (dew claws). The incisors of the upper jaw are absent and also the canines, but upper canines are often present in the males.

SYNOPSIS OF THE GENERA.

Horns, in the males only, broadly palmate throughout, ALCE.
 Horns, in both sexes, broadly palmate at the tip. . . . RANGIFER.
 Horns, in the males only, not palmate or but slightly
 so..... CARIACUS.

Genus ALCE. H. Smith.

Horns, found only in the males, very broadly palmated throughout; nose entirely covered with hair except a small naked spot between the nostrils.

36. ALCES MALCHIS AMERICANUS. (Jardine).

Moose, American Elk.

PLATE V, FIG. 2.

The moose is an awkward, ungainly animal, the largest of the family; weighing from 700 to 1400 pounds; length of head and body 6 to 7 feet; tail 10 to 15 inches; height 6 to 8 feet; head of great size; nose long and flexible; ears enormous; antlers large and spreading and weighing with the skull about 70 pounds. The

first year the horns are only knobs an inch long; the second year a foot and the third year palmated or spreading. They are cast in December, sprout in April and reach full size in June. When the velvet is removed they are beautifully white. The color of the moose is reddish brown in summer; dark gray in winter. Abundant in Northern Maine.

In summer the moose eats grass, moss, water lilies, rushes and roots of water plants; in winter the twigs of trees and shrubs and is the only one of the family which will browse on coniferous trees. The striped maple is a favorite food, hence the name "moose wood."

The calves, two in number, are usually born in May; are very strong and when three days old said to outrun a man. They follow the mother until the third year.

In summer the moose, when plagued by flies, frequently takes to the water, where, though an excellent swimmer, it is easily killed. They herd together in winter and when several herds unite, the snow may be trodden down over several acres forming a "moose yard." The moose is hunted for its hide and flesh. It is easily domesticated and lives 15 to 20 years.

Genus CARIACUS. Gray.

Horns more or less rounded, cylindrical or conical; sometimes sub-palmated; nose naked and moist.

37. CARIACUS VIRGINIANUS. (Bodd.)

Deer, Red Deer.

PLATE IV. FIG. 4.

The deer stands 4 feet high and weighs 200 pounds; length of head and body 4.5 feet; tail about 1 foot; head long; eyes large and lustrous; nose short; tail flattened; horns tending to flatten, strongly bent back, then forward. The horns are shed the last of February or a little later, sprout in May and the velvet is rubbed off in September. The summer coat is bay red to buff yellow, in winter leaden gray with under surface of body and tail white. Common about settlements and clearings in sparsely settled portions of New England.

Like other members of the deer family the food varies with the season. In summer rich herbage and pond lilies; in winter twigs and buds of numerous trees. They yard in cedar or spruce swamps;

have two young in May or June which are spotted with white. The deer drinks quantities of water daily and hunters seek it at the accustomed watering place. To escape capture it often takes to the water and is a good swimmer. Easily domesticated and the skin has a commercial value.

Genus RANGIFER. H. Smith.

Horns broadly palmated at the tips, present in both sexes, nose distinctly hairy.

38. RANGIFER CARIBOU. (Kerr).

Reindeer, Caribou, Woodland Caribou.

PLATE V, FIG. 1.

Size between the moose and deer; weight about 400 pounds; height about 4 feet; length of head and body 6 feet; tail 6 to 7 inches; general color dun gray with an increase of white hair in the winter coat; antlers vary greatly in shape. The old males shed their horns before Christmas, the young males later and the females later still. Common in Northern Maine.

In winter the food of the caribou is almost exclusively "caribou moss," a long black lichen. Various other lichens are sometimes eaten as well as twigs and buds of young trees. In summer the food consists of young shoots and grasses of various kinds. The young of the caribou unlike those of the deer are not spotted. These animals frequent the vicinity of large streams in summer, returning to the deep woods in winter. They travel in herds, are fleet and shy though easily killed by experienced hunters. The flesh is good for food and the skins are much valued.

Order CARNIVORA (Bears, cats, weasels, &c).

The mammals of this order are mostly carnivorous. They are known by possessing sharp claws, large pointed canine teeth and a simple stomach. The lower jaw is constructed to move only in a vertical plane, having no lateral motion; incisors six in each jaw, the outer largest; teeth entirely covered with enamel; molars rigid and sharp, fitted for dividing flesh.

SYNOPSIS OF THE FAMILIES.

1	{ Hind feet with four toes	2
	{ Hind feet with five toes	3
2	{ Nose blunt	5. FELIDAE.
	{ Nose elongated.	4. CANIDAE.
3	{ Teeth less than 40; body slender	3. MUSTELIDAE.
	{ Teeth 40 or more; body stout	4
4	{ Tail short	URSIDAE.
	{ Tail well developed.	1. PROCYONIDAE.

Family PROCYONIDAE (Raccoons).

Body moderately stout; tail well developed; lower jaw slender, with two true molars; feet subplantigrade; soles naked; teeth 40.

Genus PROCYON. Storr.

Muzzle pointed and projecting beyond the lower jaw; ears short and oval; tail long and bushy.

39. PROCYON LOTOR. (Linn.)

Raccoon.

PLATE II, FIG. 7.

Length of head and body about 2 feet; tail 9 to 10 inches; general color gray mixed with black; ears and under surface whitish; a black patch across the eyes; tail with four to six rings of gray and black. Common throughout New England.

The raccoon is mostly nocturnal in its habits and feeds on mice, young birds, eggs, cray fish, frogs, turtles and oysters as well as insects, nuts and corn. It does not make much of a nest but finds a resting place in a hollow high up in some large tree. From 3 to 6

young are born in the spring and remain with the mother a year. Raccoons travel and live in companies; they love to play in shallow streams and are good swimmers as well as climbers. They partially hibernate and as many as seven have been found huddled together during very cold weather as if to keep each other warm. During thaws they come out in search of food.

The raccoon is a sly beast and an old "coon" is a tough match for an average dog. It is easily trapped and is not a swift runner. The flesh is fair eating. The most docile of wild animals they are easily domesticated but are mischievous and inquisitive pets. The skin has a commercial value.

Family URSIDAE. (Bears).

Body very thick and clumsy, with a rudimentary tail; lower jaw with three true molars; feet plantigrade; teeth 42.

Genus URSUS. Linn.

Head large; body covered with thick hair; ears large and slightly acuminate.

40. URSUS ARCTOS AMERICANUS. (Pal.)

Black Bear.

The black bear weighs from 200 to 400 pounds; length from 4 to 6 feet; height 3 feet; nose nearly in a line with the forehead; palms and soles very short; eyes small; fur long, straight and shining; color dark brown or black, a yellowish patch on each side of the nose. Common in wooded or mountainous parts of New England.

The black bear feeds upon roots, berries, fruits, insects and small quadrupeds, is very fond of honey and often does much mischief in the cornfield by breaking down and devouring the corn. Not infrequently it has been known to approach the barn and carry off young animals. It feeds mostly by night, and during the warmer months frequents swamps, feeding upon mollusks, reptiles, salamanders, &c. The bear hibernates, and as winter approaches makes its den in holes and caves in the rocks, beneath fallen trees or in hollow logs. The den is strewn with moss, leaves and evergreen branches.

Like all animals that spend the winter in a torpid condition it has a large store of fat in different parts of the body, particularly in front of the heart. This is absorbed during the winter and the bear comes out in the spring lean and hungry. During hibernation the female produces young, usually two in number, not later than February and cares for them until the winter breaks without herself partaking food. It is said that bears have young but once in three years. The cubs are very small when born and are about the size of large kittens when they appear in the spring. The bear is not a ferocious animal and rarely attacks man unless wounded or in defense of its young. It sometimes climbs trees, and when angered and fighting, it uses its powerful claws as well as its sharp teeth, and if able to "close in" will hug fiercely with the fore limbs and with the hind feet tear the flesh of its victim in a horrible manner. Bears make interesting pets but in growing old become unruly and often dangerous. The flesh is good eating and the skin has considerable value.

Family MUSTELIDAE (Otter, skunk, mink, weasel, &c.)

The animals of this family are valuable for their fur. They have long slender bodies and five-toed feet which are plantigrade or digitigrade. Most species have glands which secrete a fetid liquid.

SYNOPSIS OF THE GENERA.

1	{ Length of body three feet or more.....	2
	{ Length of body less than three feet..	3
2	{ Feet webbed	LUTRA.
	{ Feet not webbed..	GULO.
3	{ Toes short; claws retractile	MEPHITIS.
	{ Fore toes long; claws not retractile..	4
4	{ Teeth, 38	MUSTELA.
	{ Teeth, 34	PUTORIUS.

Genus LUTRA. Linn.

Head large and flattened, terminating in a blunt muzzle; ears short and round; legs short; toes webbed and armed with short claws.

41. LUTRA CANADENSIS. Turt.

Otter.

PLATE III. FIG. 1.

Body cylindrical and long; length of head and body 2.5 feet; tail 1.5 feet; tail stout, tapering to the end flattened through half its

length; fur soft, fine and dense, of a dark glossy brown; chin and throat dusky white. Common in some parts of New England.

The otter is thoroughly amphibious and can live under water a long time, swimming and diving with ease. It is expert at catching fish which form its principal food. Also eats cray fish and frogs. The nest is generally made under some shelving bank or uprooted tree or in a burrow in the bank of a stream or pond. This nest is lined with grass and the young, two in number, are born about the middle of April. Three otters, the female and young, are usually seen together during the summer.

The otter is a restless animal and when travelling makes a peculiar trail by sliding itself along and dragging its tail. In winter on the ice its advance is rapid by a run and a slide. It is also fond of sliding down hill both in winter on the snow and in summer on the steep banks of streams. In many places on the coast of Maine it lives among the rocks on the shores, and where a large rock affords a smooth sloping surface, it slides in winter and plunges off into the water returning again and again for the sport. The otter is easily tamed; fur very valuable being prime in November and best in spring.

Genus MEPHITIS Cuvier.

Head short; nose somewhat projecting; hair unusually long, especially on the tail; toes of the fore feet armed with long curved claws used in digging; fetid glands highly developed.

42. MEPHITIS MEPHITICA. Shaw.

Skunk, Pole Cat, Alaska Sable.

PLATE II. FIG. 6.

Body rather short; length of head and body 18 inches; tail 12 inches; general color black with white longitudinal stripes on the back, varying much in the white marking. Common throughout New England.

The skunk is mostly nocturnal. Its food consists of insects, birds' eggs, small reptiles and mice varied by the results of frequent visits to the poultry yard. Merriam says, "The skunk is pre-eminently an insect eater; he destroys more beetles, grass-hoppers and the like than all our other mammals together, and in addition to these devours vast numbers of mice." Its retreats are under-

ground burrows, hollow logs and stumps. The excavations run near the surface of the ground for 6 or 8 feet, ending in a chamber lined with leaves, where may be found in winter five to fifteen huddled together. The skunk is very prolific, bringing forth six to ten young at a birth, which are blind, covered with short hair and look like kittens. These young remain with the parents in one hole for a year; they hibernate only during the severest portion of the winter; the occurrence of a thaw at any time brings them out but colder weather drives them back to their burrows. They are easily tamed and exceedingly cleanly in their habits making agreeable pets by removing the scent glands. The fur which is called Alaska Sable has a commercial value, especially that without the white marking. It is said that the bite of the skunk causes hydrophobia.

Genus GULO. Storr.

Body heavy and clumsy, covered with shaggy hair; legs short and thick; soles densely hairy; tail full and bushy.

43. GULO LUSCUS (Linn.)

Walverene, Glutton, Caracjou.

PLATE II. FIG. 5.

Length 2 to 3 feet; tail 6 to 9 inches; head round; nose pointed, short; color blackish or dusky brown with a broad band of chestnut along the sides circumscribing a dark dorsal area; in front irregular spots of light color. Color varies with age and season. Occurs rarely in extreme Northern Maine.

The wolverene preys upon hares, partridges and foxes in their burrows, also anything it can steal from the hunter's cache and traps. It not only robs the traps of their contents but carries off the traps themselves. It is notorious for its gluttonous habits, its ferocity and thievishness. The young are four or five in number and are cream color at birth. They are born in June or July in underground burrows.

Genus MUSTELA. Linn.

Body slender; head small and oval; ears short and round; teeth

SYNOPSIS OF THE SPECIES.

Length less than 20 inches	<i>M. martes.</i>
Length more than 24 inches	<i>M. pennanti.</i>

44. MUSTELA PENNANTI. Erxl.

Fisher, Pekan, Pennant's Marten, Black Cat.

The fisher is a size between the wolverene and the marten; length of head and body 2 to 3.5 feet; tail about 12 inches; head resembling wolverene; body resembling the marten; color brownish black with head and shoulders mixed with gray and brown. Color varies with age and season; some specimens have white markings. Occurs rarely in Maine.

The name of this animal is misleading as it lives away from the water, does not catch fish like the otter and mink but in its habits is very much like the marten or sable. Its food consists of small animals also raccoons, porcupines, birds and their eggs, &c. The fisher is a persistent thief; often robbing marten traps nightly and with great regularity. Some writers claim that it occasionally eats nuts and other vegetable matter. It frequents deep forests and wooded mountain sides and nests in hollow trees 30 or 40 feet from the ground. Two to four young are born about the first of May. When taken young it is easily tamed. The fur has a commercial value and the animal is caught in traps.

45. MUSTELA MARTES. Linn.

Marten, Pine Marten, American Sable.

PLATE II, FIG. 2.

Body less stout than the fisher; length of head and body 12 to 18 inches; tail 9 to 12 inches, full and bushy, pointed; feet densely furred; general color reddish yellow clouded with black, darker in winter. Occurs rarely in the pine forests of Maine.

The marten is wholly arboreal in its habits, is found chiefly in pine forests hence is often called pine marten. It is an expert climber and is said to jump from one tree to another as fast as a man can run; is active both night and day. Its food consists of the weaker rodents, birds, reptiles and insects; also it is said to eat nuts and the seeds of hemlock buds. It nests in hollow

trees, rarely in the ground and has two to eight young in April. It does not hibernate nor lay up food. The marten is tamed as easily as the squirrel and makes an agreeable pet, having only a slight musky odor characteristic of its family. It is captured in wooden traps and its fur is of the richest quality and very valuable.

Genus PUTORIUS. Cuvier.

Body slender; tail long; teeth 34.

SYNOPSIS OF THE SPECIES.

Length from 8 to 11 inches *P. erminea*.
 Length from 6 to 7 inches *P. vulgaris*.
 Length from 15 to 20 inches *P. vison*.

46. PUTORIUS ERMINEA. (Linn.)

Ermine, Stoat.

Body long and cylindrical; legs short; length of head and body 8 to 11 inches; tail 5 to 6 inches; color in summer, brown above, pale yellow beneath; in winter, white; tail bushy, tipped with black. Common throughout New England.

It is said that an early fall of snow may cause an ermine to turn white in forty-eight hours. It is a blood-thirsty animal, hunting both day and night for moles, shrews and mice. It also devours birds and their eggs. It attacks animals many times its own size, such as rabbits, squirrels and poultry. Audubon says he has known forty full grown fowls to have been killed in one night by a single ermine. It only eats the brains and sucks the blood of its victims. The nest is made in old walls and heaps of rocks and if no other place is afforded it burrows in the ground. The nest is lined with mouse skins, is very warm and is used year after year. The ermine has four or more young two or three times in a year. The young remain near the home nest all summer. If taken young the ermine can be easily tamed.

47. PUTORIUS VULGARIS. (Linn.)

Weasel, Least Weasel.

PLATE II. FIG. 3.

Form like the ermine; length of head and body 6 to 7 inches; tail 2 inches; color same as the ermine except that the tail is not

tipped with black, though dusky at the end. Baird says, "It is supposed to remain brown throughout the year within the limits of the United States" but Allen says, "Both species usually become white in winter as far south as northern New England, but in Massachusetts only the larger one thus changes and this not always." Common in New England.

The habits of the weasel are much the same as the ermine but it confines itself to smaller prey and is not so destructive to poultry. The weasel will fight in defense of its young with desperation even to the sacrifice of life. Like the ermine its fur is of a fine quality and valuable.

48. PUTORIUS VISON. (Briss)

Mink.

PLATE II. FIG 4.

Length of head and body 15 to 20 inches ; tail 7 to 8 inches ; head small ; nose short, flat and thick ; eyes small ; feet and palms covered with hair ; tail round, tapering to the end with the longer hairs standing out horizontally giving a bushy appearance ; upper surface dark brown to black, under surface light brownish yellow ; tail darkest towards the end, often black. Some specimens have a white spot under the throat and a longitudinal white stripe on the throat. Common throughout New England.

The mink is amphibious, frequenting the banks of streams, swampy places and other water courses. It swims and dives rapidly and is a good fisher. Its food consists of frogs, fresh water clams, fish and sometimes poultry. The nest is made in burrows in banks of streams or in hollow logs ; it is well lined with feathers or the fur of the female. The mink produces five to six or more young in April. The young are blind, naked and of a light color, but by the time the eyes are open they have a beautiful coat of glossy hair. They are easily tamed and make vigorous ratters, quickly exterminating these pests. The mink is very tenacious of life ; has a disagreeable odor. The skin has a commercial value.

Family CANIDAE. (Wolf and Fox).

Mammals of this family are digitigrades ; their claws are comparatively blunt, not capable of being retracted. All have comparatively smooth tongues.

SYNOPSIS OF THE GENERA.

Tail comparatively short. CANIS.
 Tail comparatively long and bushy. VULPES.

Genus VULPES. Brisson.

Pupil of eye oval; body slender; ears erect; tail long and bushy.

SYNOPSIS OF THE SPECIES.

Tail with a concealed mane of stiff hairs *V. virginianus*.
 Tail with soft fur and long hair *V. vulgaris pennsylvanicus*.

49. VULPES VULGARIS PENNSYLVANICUS. (Bodd.)

Red Fox, Cross Fox, Black Fox, Silver Fox.

This animal is formed for lightness and speed; length of head and body 2.5 feet; tail 17 inches; nose acute; feet and toes covered with hair concealing the nails; color reddish above, white beneath; front part of fore legs and feet black; tip of bushy curling tail white. The color varies from reddish through the various shades of gray to black. Common throughout New England.

The red fox is active by day as well as by night, and preys upon skunks, woodchucks, muskrats, hares, squirrels, mice, grasshoppers, birds, eggs and poultry, therefore having a bad reputation with the farmer. It will seize a goose by the neck and tossing the body over its shoulder make off at a lively rate; and has been known to carry off young lambs; also said to be fond of ripe grapes and strawberries. The red fox digs an extensive burrow with two or three openings, or makes his den beneath ledges of rocks or under roots of fallen trees. The young, usually four, are born in March or April. They are blind, of a maltese color and are not seen at the mouth of the den for about six weeks.

The cunning of the fox is proverbial. Stories illustrating its sagacity are familiar to every one. The fox is taken in traps but is so wary that it is necessary to set them with great nicety. It is also taken in the chase by aid of dogs or driven to its den and then dug out. A fox hunt is considered great sport in many localities.

The red fox makes a pretty pet and when young can easily be tamed but it always proves deceitful and treacherous.

The red fox with its varieties, the cross, silver and black fox is valuable for its fur.

50. *VULPES VIRGINIANUS.* (Erxl.)

Gray Fox.

Head and body nearly 2 feet in length; tail about 12 inches; body stouter, head shorter and broader than the red fox; legs short with four toes on each foot; ears high and pointed; tail large and bushy; prevailing color, mixed, hoary and black; under parts whitish tinged with light brown. This species is a southern form but is said to occur rarely in southern New England.

The habits of the gray fox are much the same as those of the red species. It makes its nest in hollow logs or beneath large rocks and does not burrow. It produces from three to five young in March or April. The gray fox, as also the red fox barks like a dog. Does not tame easily nor make a good pet. When hard chased will climb trees.

Genus *CANIS.* Linn.

Pupils circular; muzzle long; ears erect.

51. *CANIS LUPUS.* Linn.

Wolf.

PLATE II. FIG. 1.

Body long, gaunt; 4 feet in length; tail 15 inches; skull broad; neck and tail covered with bushy hair; tail straight; color light gray. Found rarely in the northern part of New England.

The wolf feeds upon skunks, rabbits and other small animals and in winter is able to run down deer in the deep snow. When the prey is exhausted it attacks the throat and sucks the blood. The nest is made in caverns, under the upturned roots of fallen trees or in holes in the ground. From six to ten young are produced in April or May. Wolves travel in packs, are always hungry and exceedingly noisy. They avoid open ground by day but at night they sometimes leave the woods and howl about the camps of lumbermen or settlers. They are very cowardly but so crafty as to be rarely caught in traps. Fur of some value.

Family *FELIDAE.* (Cats).

The animals of this family are also digitigrade, but they differ from the *Canidae* in having claws retractile into a sheath. All have rough tongues with numerous sharp recurved papillae.

Genus FELIS. Linn.

Tail short or of medium length.

SYNOPSIS OF THE SPECIES.

1	{ Length of body over four feet; tail long, Length of body less than four feet; tail short	<i>F. concolor.</i>
2		{ Ears tufted; feet large <i>F. borealis canadensis.</i> Ears slightly tufted; feet medium. <i>F. borealis rufus.</i>

52. FELIS CONCOLOR. Linn.

Panther, Cougar, Catamount.

PLATE I. FIG. 5.

Body long and slender, from 4 to 5 feet in length; tail 32 to 36 inches; height 30 inches; head small; ears rounded; legs short and stout; tail slender, cylindrical, sometimes trailing; fur soft, short, of a uniformly pale brownish yellow; ears blackish behind. Rarely found in New England, and only in the wildest parts and dense forests.

The panther hunts both day and night and feeds chiefly upon young deer, rabbits, raccoons, porcupines and other small animals. It creeps as stealthily upon its prey as a cat upon a mouse and clears a distance of 18 to 20 feet at a bound. Its courage is not great and unless wounded and at bay seldom attacks man. Panthers growl, mew and cry after the manner of cats. Many blood-curdling stories have been told of their ferocity, the truth of which may be doubted. They travel far and wide, make their lair in a cliff or ledge of rocks and produce one to four kittens at a birth, late in winter or in early spring. The female shows great care in protecting her young and defends them at the sacrifice of her life. These animals seldom climb trees. They may be tamed when taken young but become treacherous as they grow older.

53 FELIS BOREALIS CANADENSIS. (Raf.)

Canada Lynx, Loupcervier.

PLATE I FIG. 6.

Smaller than the panther, being from 37 to 40 inches in length; tail 5 to 6 inches; feet large; ears angular, tipped with a pencil of

hairs 2 or 3 inches long. A broad ruff of hair surrounds the throat beneath the chin; general color gray clouded with irregular dark spots; tail yellowish white beneath with the extreme tip black. Found in the northern parts of New England.

The lynx (or loupcevier as it is called by the French Canadians,) confines itself to thinly settled districts. It preys upon the northern hare, partridges and young deer and has been known to devour pigs and lambs, but its visits to the farm yard are rare from the fact that its haunts are usually remote from the paths of man. Its lair is located in a cavern or hollow tree where it produces two young. It travels at a long gallop and contrary to the habits of most cats frequently takes to the water.

54. FELIS BOREALIS RUFUS. (Guld.)

Bay Lynx, Wild Cat.

Catlike in form; head and body 30 to 33 inches in length; tail 5 inches; feet small; color reddish brown or ashy brown, with a whitish spot bordered with black on the hinder part of the ear; tail white beneath and at the extreme tip with a square black patch above; four and hind legs banded inside. Common but not abundant in various parts of New England.

The wild cat inhabits swampy retired places, dense thickets and wooded hillsides, feeding upon rabbits and smaller animals. In some parts of New England it frequents the vicinity of farm houses where it enters the yard and carries off pigs, ducks, chickens and geese. It makes its lair in hollow trees or under the roots of stumps lining it with moss and dry leaves. The young, from two to four in number, resemble young kittens, having short hair and closed eyes. The wild cat is not strictly nocturnal. When enraged it is a most ferocious looking animal but is cowardly in its nature; not easily tamed; fur of some value.

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Cougar	52	Mouse, Meadow	6
Deer.....	37	Mouse, Pine	7
Deer, Red	37	Mouse, Red-backed	8
Ermine	46	Mouse, White-footed	12
Fisher	44	Mouse, Wood	8
Fox, Black	49	Muskrat	5
Fox, Cross	49	Musquash	5
Fox, Gray	50	Otter	41
Fox, Red	49	Panther	52
Fox, Silver.....	49	Pekan	44
Glutton	43	Polecat	42
Ground Hog	15	Porcupine	3
Hare, American.....	1	Porcupine, Canada.....	3
Hare, Northern	1	Rabbit	1
Hare, Southern Varying...	1	Rabbit, Gray	2
Hare, Wood.....	2	Rabbit, White	1

	Number.		Number.
Rabbit, Wood	2	Shrew, Thompson's.....	23
Raccoon	39	Skunk	42
Reindeer.....	38	Squirrel, Chipping	16
Rat, Black.....	10	Squirrel, Flying	20
Rat, Brown.....	9	Squirrel, Fox	19
Rat, Norway	9	Squirrel, Gray	18
Rat, Wharf	9	Squirrel, Ground	16
Rat, Wood.....	13	Squirrel, Hudson's Bay ...	17
Sable, Alaska.....	42	Squirrel, Red	17
Sable, American	45	Squirrel, Striped.....	16
Shrew, Broad-nosed.....	26	Stoat	46
Shrew, Cooper's	24	Weasel	47
Shrew, Foster's.....	25	Weasel, Least	47
Shrew, Marsh.....	22	Wolf	51
Shrew, Mole	21	Wolverene.....	43
Shrew, Short-tailed	21	Woodchuck.....	15

PLATE I.

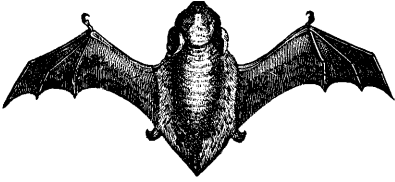


Fig. 1. Hoary Bat.



Fig. 2. Thompson's Shrew.

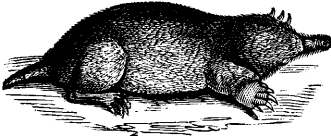


Fig. 3. Common Mole.



Fig. 4. Star-nosed Mole—
end of muzzle.

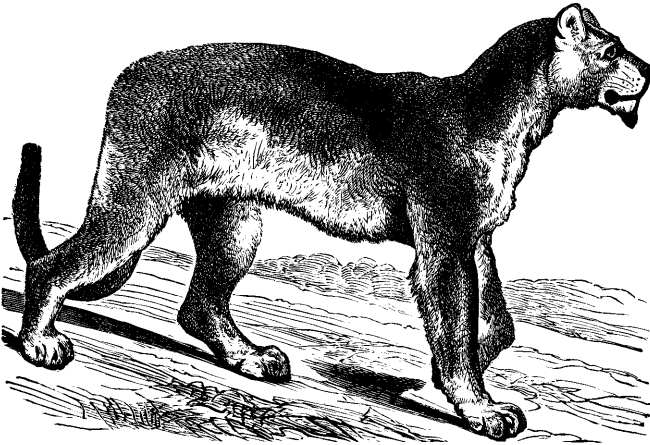


Fig. 5. Panther.

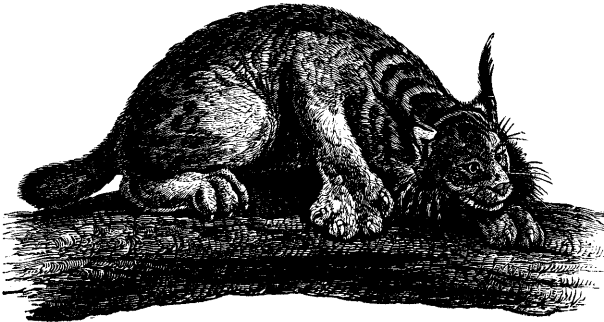


Fig. 6. Canada Lynx.



PLATE II.

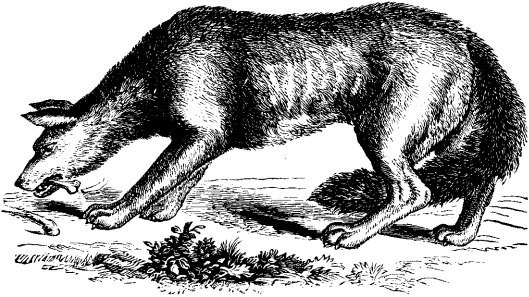


Fig. 1. Wolf.



Fig. 2. American Sable.



Fig. 3. Weasel.



Fig. 4. Mink.



Fig. 5. Wolverine.



Fig. 6. Skunk.

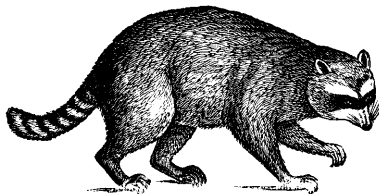


Fig. 7. Raccoon



PLATE III.

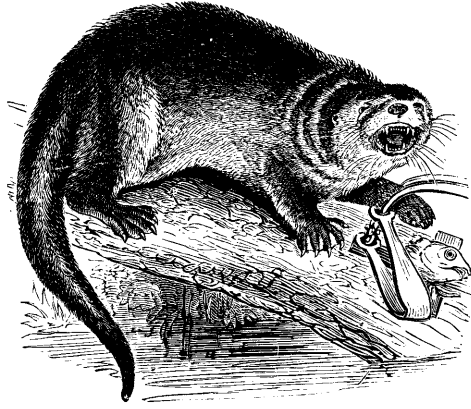


Fig. 1. Otter.



Fig. 2. Beaver.



Fig. 3. Jumping Mouse.



Fig. 4. White-footed Mouse.



PLATE IV.



Fig. 1. Flying Squirrel.



Fig. 2. Striped Squirrel.



Fig. 3. Porcupine.



Fig. 4. Deer.

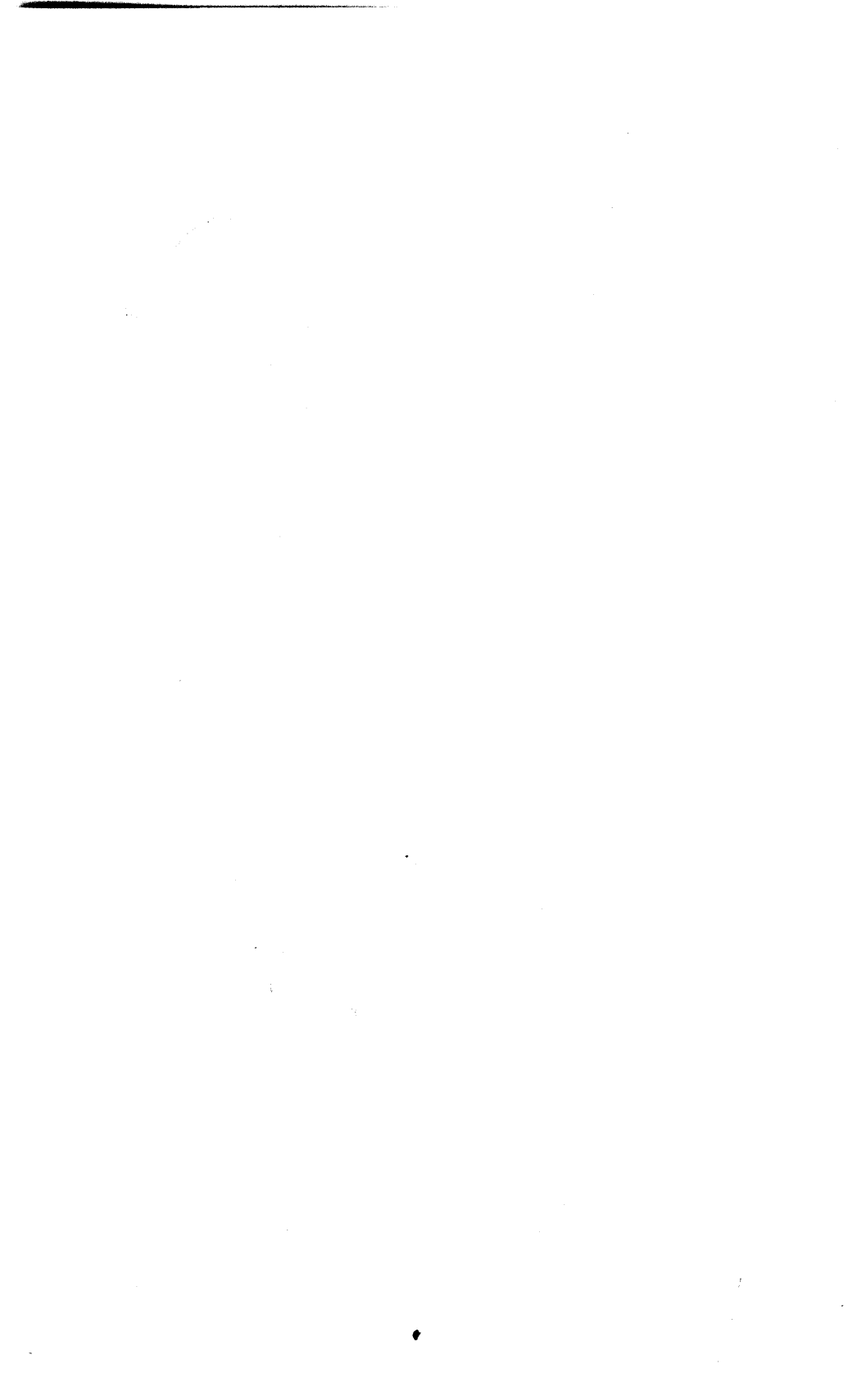


PLATE V.



Fig. 1. Caribou.

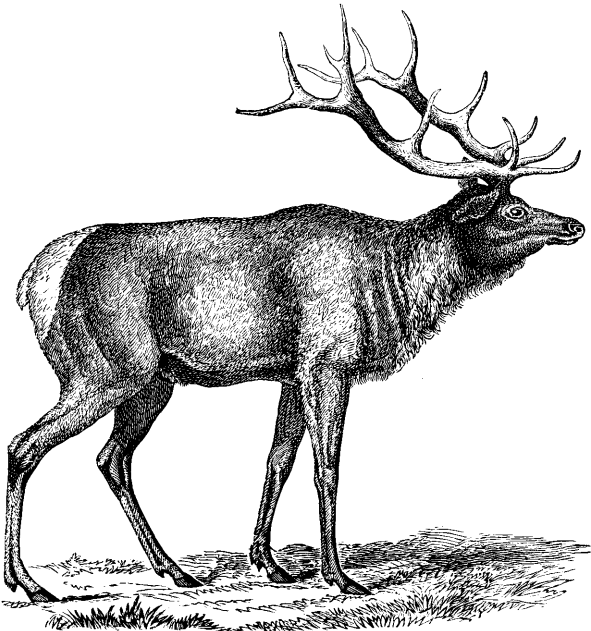


Fig. 2. Moose.

