

M. I. T. ANNUAL CATALOGUES AND BULLETINS

1880/81

01 OF 01

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

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SIXTEENTH

ANNUAL CATALOGUE

OF THE

OFFICERS AND STUDENTS,

WITH A

STATEMENT OF THE COURSES OF INSTRUCTION,

And a List of the Alumni, and of the Members of the Society of Arts.

1880-1881.

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BOSTON:

W. J. SCHOFIELD, PRINTER, 105 SUMMER STREET.

1880.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

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1880.

*CALENDAR.*

School-year began . . . . .	Monday, Sept. 27, 1880.
Second term begins . . . . .	Tuesday, Feb. 1, 1881.
Degrees conferred . . . . .	Friday, June 3, 1881.
First Entrance Examinations . . . . .	{ Tuesday, June 7, 1881, and Wednesday, June 8, 1881.
Second Entrance Examinations . . . . .	{ Wednesday, Sept. 21, 1881, and Thursday, Sept. 22, 1881.
Examinations for Advanced Standing . . . . .	Friday, Sept. 23, 1881.
The next School-year will begin . . . . .	Monday, Sept. 26, 1881.

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*Extracts from Acts of the General Court of Massachusetts, in relation to the Massachusetts Institute of Technology.*

*Act of Incorporation.* "William B. Rogers [and others named], their associates and successors, are hereby made a body corporate, by the name of the MASSACHUSETTS INSTITUTE OF TECHNOLOGY, for the purpose of instituting and maintaining a Society of Arts, a Museum of Arts, and a School of Industrial Science, and aiding generally, by suitable means, the advancement, development, and practical application of sciences in connection with arts, agriculture, manufactures, and commerce."

*Chapter 183, Acts and Resolves of 1861.*

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*Grant of Public Lands.* "When the Massachusetts Institute of Technology shall have been duly organized, located, and established, . . . there shall be appropriated and paid to its treasurer, each year, on the warrant of the Governor, for its endowment, support, and maintenance, one third part of the annual interest or income which may be received from the fund created under and by virtue of the 130th chapter of the Acts of the 37th Congress, at the second session thereof, approved July 2, 1862 [giving Public lands to the States in aid of instruction in Agriculture, the Mechanic Arts, and Military Science and Tactics]. . . . Said Institute of Technology, in addition to the objects set forth in its Act of Corporation [as above quoted], shall provide for instruction in military tactics."

*Chapter 186, Acts and Resolves of 1863.*

---

*Power to confer Degrees.* "The Massachusetts Institute of Technology is hereby authorized and empowered to award and confer degrees appropriate to the several courses of study pursued in said Institution, on such conditions as are usually prescribed in universities and colleges in the United States, and according to such tests of proficiency as shall best promote the interests of sound education in this Commonwealth."

*Chapter 247, Acts and Resolves of 1868.*

CORPORATION  
OF THE  
MASSACHUSETTS INSTITUTE OF TECHNOLOGY,  
FOR THE YEAR 1880-1881.

---

**President.**

WILLIAM B. ROGERS.

**Treasurer.**

JOHN CUMMINGS.

**Committee on the School of Industrial Science,**

EDWARD ATKINSON,  
HOWARD A. CARSON,  
CHARLES L. FEINT,  
FRED. W. LINCOLN,  
AUGUSTUS LOWELL,

CHARLES J. PAINE,  
EDWARD S. PHILBRICK,  
JOHN D. PHILBRICK,  
HENRY B. ROGERS.

President and Treasurer, *ex-officio*.

**Committee on Finance.**

WILLIAM ENDICOTT, Jr.,  
JOHN M. FORBES,  
HENRY P. KIDDER,

JAMES L. LITTLE,  
SAMUEL D. WARREN,  
DAVID R. WHITNEY.

President and Treasurer, *ex-officio*.

**Committee on the Museum.**

SAMUEL C. COBB,  
CHARLES FAIRCHILD,  
JOHN AMORY LOWELL,

E. R. MUDGE,  
M. D. ROSS,  
NATHANIEL THAYER.

President, *ex-officio*.

**Committee on the Society of Arts.**

JOHN D. RUNKLE,  
MARSHALL P. WILDER,  
THOMAS T. BOUVE,  
GEORGE B. EMERSON,

JAMES B. FRANCIS,  
J. C. HOADLEY,  
SAMUEL K. LOTHROP,  
ALEXANDER H. RICE.

President, *ex-officio*.

**On the Part of the Commonwealth.**

HIS EXCELLENCY, GOVERNOR JOHN D. LONG.

HON. HORACE GRAY, *Chief Justice of the Supreme Court.*

HON. JOHN W. DICKINSON, *Secretary of the Board of Education.*

---

LEWIS WM. TAPPAN, JR., *Bursar.*

## OFFICERS OF INSTRUCTION.

---

WILLIAM B. ROGERS, LL.D., *President.*

- JOHN D. RUNKLE, PH.D., LL.D.,  
*Walker Professor of Mathematics.*
- JOHN B. HENCK, A.M.,  
*Hayward Professor of Civil and Topographical Engineering.*
- WILLIAM R. WARE, S.B.,  
*Professor of Architecture.*
- WILLIAM P. ATKINSON, A.M.,  
*Professor of English and History.*
- GEORGE A. OSBORNE, S.B.,  
*Professor of Mathematics.*
- JOHN M. ORDWAY, A.M.,  
*Professor of Metallurgy and Industrial Chemistry.*
- ROBERT H. RICHARDS, S.B.,  
*Professor of Mining Engineering, and Director of the Mining and Metallurgical Laboratories.*
- WM. RIPLEY NICHOLS, S.B.,  
*Professor of General Chemistry.*
- CHARLES P. OTIS, A.M., PH.D.,  
*Professor of Modern Languages.*
- CHARLES H. WING, S.B.,  
*Professor of Analytical and of Organic Chemistry.*
- ALPHEUS HYATT, S.B., Custodian of Boston Society of Natural History,  
*Professor of Zoology and Palaeontology.*
- WILLIAM H. NILES, PH.B., A.M.,  
*Professor of Geology and Geography.*
- CHANNING WHITAKER, S.B.,  
*Professor of Mechanical Engineering.*
- CHARLES R. CROSS, S.B.,  
*Thayer Professor of Physics.*
- GAETANO LANZA, S.B., C.E.,  
*Professor of Theoretical and Applied Mechanics.*



- EUGENE LETANG,  
*Assistant Professor of Architecture.*
- JULES LUQUIENS, Ph.D.,  
*Assistant Professor of Modern Languages.*
- CHARLES KASTNER,  
*Lowell Instructor in Practical Design.*
- HENRY N. MUDGE,  
*Instructor in Mechanical and Free-hand Drawing.*
- HENRY K. BURRISON, S.B.,  
*Instructor in Mechanical Drawing.*
- CLARENCE W. FEARING, A.M.,  
*Instructor in the School of Mechanic Arts.*
- ELLEN H. RICHARDS, A.M., S.B.,  
*Instructor in Chemistry and Mineralogy in the Woman's Laboratory.*
- SILAS W. HOLMAN, S.B.,  
*Instructor in Physics.*
- WILLIAM O. CROSBY, S.B.,  
*Instructor in Geology and Palaeontology.*
- COL. JOHN C. CHADWICK,  
*Instructor in Military Tactics.*
- HENRY M. WAITT, S.B.,  
*Assistant in Civil Engineering.*
- WM. HENRY BEECHING, S.B.,  
*Assistant in Mechanical Engineering.*
- W. KELTNER ROBBINS, M.S.,  
*Assistant in Quantitative Analysis.*
- WM. H. PICKERING, S.B.,  
*Assistant in Physics.*
- FREDERICK H. PRENTISS, S.B.,  
*Assistant in the Mining and Metallurgical Laboratory.*
- FRED. S. PEARSON,  
*Assistant in General Chemistry and Qualitative Analysis.*
- GEORGE H. BARTON, S.B.  
*Assistant in Drawing.*

---

The instruction in Descriptive Geometry and Stereotomy is given by Prof. OSBORNE; that in Mineralogy and Assaying by Prof. RICHARDS; that in Descriptive Astronomy by Prof. CROSS; and that in Botany and Biology by Prof. ORDWAY. The instruction in Quantitative Analysis in the Woman's Laboratory is also in charge of Prof. ORDWAY.

THOMAS FOLEY,

*Instructor in Iron Working.*

GEORGE SMITH,

*Instructor in Carpentry.*

JAMES HOBBS,

*Instructor in Wood Turning and Pattern Work.*

---

*Instructor in Foundry Work.*

ARTHUR W. SANBORN,

*Assistant in Iron Working.*

WILLIAM C. FISHER,

*Assistant in the Weaving Department of the Lowell School of Practical  
Design.*

## FACULTY.

---

WILLIAM B. ROGERS, LL.D., *President.*

JOHN D. RUNKLE, Ph.D., LL.D.

JOHN B. HENCK, A.M.

WILLIAM R. WARE, S.B.

WILLIAM P. ATKINSON, A.M.

GEORGE A. OSBORNE, S.B.

JOHN M. ORDWAY, A.M., *Chairman.*

ROBERT H. RICHARDS, S.B. *Secretary.*

WILLIAM RIPLEY NICHOLS, S.B.

CHARLES P. OTIS, A.M., Ph.D.

CHARLES H. WING, S.B.

ALPHEUS HYATT, S.B.

WILLIAM H. NILES, Ph.B., A.M.

CHANNING WHITAKER, S.B.

CHARLES R. CROSS, S.B.

GAETANO LANZA, S.B., C.E.

## STUDENTS.

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### GRADUATE STUDENTS.

NAME.	HOME.	RESIDENCE.
Binney, Amos, <i>A.B.</i> ( <i>Harvard College</i> ) . . .	Boston, . . . . .	1 St. Charles St.
Ely, Edward F., <i>A.B.</i> ( <i>Brown University</i> ) . . .	Providence, R. I., . . .	116 Chandler St.
Faunce, George, Jr., <i>A.B.</i> ( <i>Harvard College</i> ) . . .	Kingston, . . . . .	Kingston.
Glover, Marie O., <i>A.B.</i> ( <i>Vassar College</i> ) . . . . .	Brooklyn, N. Y., . . .	Jamaica Plain.
Grant, James, <i>LL.D.</i> ( <i>Univ. of North Carolina</i> )	Leadville, Col., . . . . .	Hotel Brunswick.
Johnson, William P., <i>A.B.</i> ( <i>Dartmouth College</i> ) . . .	Lynn, . . . . .	Lynn.
Kidder, Frank F., <i>B.C.E.</i> ( <i>Maine State College</i> ) . . .	Bangor, Me., . . . . .	79 Appleton St.
Lindsay, Wm. B., <i>A.B.</i> ( <i>Boston University</i> ) . . .	W. Newton, . . . . .	W. Newton.
Loring, Frederic R., <i>S.B.</i>	Boston, . . . . .	8 Greenwich Park.
Motley, George S., <i>A.B.</i> ( <i>Harvard College</i> ) . . . . .	Lowell, . . . . .	Lowell.
Osgood, Henry B., <i>A.B.</i> ( <i>Harvard College</i> ) . . . . .	Roxbury, . . . . .	2 Guild St.
Seovel, Minor, <i>Ph.B.</i> ( <i>Western Univ., Penn.</i> )	Pittsburgh, Pa., . . . . .	4 Mt. Vernon St.
Sears, George G., <i>A.B.</i> ( <i>Brown University</i> ) . . . . .	Boston, . . . . .	100 Pinckney St.
Tuxbury, Helen, <i>A.B.</i> ( <i>Smith College</i> ) . . . . .	Charlestown, . . . . .	55 Warren St.

## REGULAR STUDENTS.

I. Civ. Eng.; II. Mech. Eng.; III. A, Min. Eng.; III. B, Geol. and Min.; IV. Arch.; V. Chem.; VI. Metal; VII. Nat. Hist.; VIII. Phys.; IX. Elect.; X. Sci. and Lit.

## FOURTH YEAR.

NAME.	COURSE.	HOME.	RESIDENCE.
Abbott, Ira, . . . .	I.	Andover, . . . .	Andover.
Allen, John H. . . .	III.	Walpole, . . . .	Walpole.
Atkinson, James S. . .	II.	Brookline, . . . .	Brookline.
Binney, Amos, <i>A.B.</i> , .	V.C.	Boston, . . . .	1 St. Charles St.
Bissell, David S. . . .	III.	Pittsburgh, Pa., . .	134 St. James Ave.
Briggs, Frank H. . . .	IX.	Boston, . . . .	124 Marlboro St.
Came, Frank E. . . .	I.	Malden, . . . .	Malden.
Chase, Frank D. . . .	III.	Dedham, . . . .	Dedham.
Collins, Benjamin G. .	II.	Edgartown, . . . .	282 W. Canton St.
Cutler, Harry H. . . .	II.	Boston, . . . .	19 W. Cedar St.
Darlington, F. Graef, .	IX.	Alleghany City, Pa.,	80 Pinckney St.
Duff, John, Jr., . . .	V.B.C.	Charlestown, . . . .	14 Sheafe St.
Glover, Marie O., <i>A.B.</i> ,	V.C.	Brooklyn, N. Y., . .	Jamaica Plain.
Goddard, David S. . . .	III.B.	Lowell, . . . .	Lowell.
Kidder, F. E., <i>B.C.E.</i> , .	IV.	Bangor, Me., . . . .	79 Appleton St.
Kochler, Walter J. . .	V.B.C.	Boston, . . . .	Beech Glen Ave.
Lewis, Edwin J., Jr., .	IV.	Boston, . . . .	Adams St.
Lindsay, Wm. B., <i>A.B.</i> , .	V.A.	W. Newton, . . . .	W. Newton.
Lund, James, . . . .	V.A.	Charlestown, . . . .	28 Sever St.
Mower, George A. . . .	II.	W. Newton, . . . .	W. Newton.
Norris, Webster, . . .	III.B.	Charlestown, . . . .	43 Seley St.
Parker, Theodore, . . .	I.	Quincy, . . . .	Quincy.
Scovel, Minor, <i>Ph.B.</i> , .	I.	Pittsburgh, Pa., . .	4 Mt. Vernon St.
Shed, Nathaniel W. . .	V.C.	Roxbury, . . . .	27 Fountain St.
Snead, William R. . . .	IV.	Louisville, Ky., . . .	80 Pinckney St.
Stearns, Harold E. . .	II.	Wyoming, O., . . . .	137 St. James Ave.
Walton, Evelyn M. . . .	V.C.	Saugus, . . . .	Saugus.
Warren, Edward R. . .	VII.	Waltham, . . . .	Waltham.
Wilkes, Charles M. . .	IV.	So. Manchester, Ct.,	80 Pinckney St.
Winslow, Arthur, . . .	III.	Boston, . . . .	104 Chestnut St.
Young, Herbert A. . . .	I.	Revere, . . . .	Revere.

## THIRD YEAR.

NAME.	COURSE.	HOME.	RESIDENCE.
Ames, Clara P. . . .	V.c.	Jamaica Plain, . . .	Jamaica Plain.
Butler, Alfred, . . .	V.c.	Boston, . . . . .	78 Carver St.
Carson, Thomas B. . .	II.	Iowa City, Ia., . . .	729 Tremont St.
Ely, Edward F., <i>A. B.</i>	IV.	Providence, R. I., . .	116 Chandler St.
Faunce, George, Jr. <i>A. B.</i>	III.A.	Kingston, . . . . .	Kingston.
French, Charles A. . .	III.A.	Boston, . . . . .	334 Marlboro St.
Frost, Howard V. . . .	V.c.	Belmont, . . . . .	Belmont.
Hall, Francis P. . . .	V.c.	Dorchester, . . . . .	9 St. Charles St.
Heins, George L. . . .	IV.	Philadelphia, . . . . .	58 Pinckney St.
Jenkins, Charles D. . .	V.c.	So. Boston, . . . . .	66 G St.
Johnson, James W. . .	I.	Chelsea, . . . . .	Chelsea.
Lowe, John F. . . . .	V.c.	Chelsea, . . . . .	Chelsea.
Manning, Harry G. . . .	II.	Lynn, . . . . .	Lynn.
Mansfield, Frank, . . .	I.	Melrose Highlands, . . .	Melrose Highlands.
Mansfield, George W.	III.B.	Melrose Highlands, . . .	Melrose Highlands.
Morrison, Frank C. . .	I.	Boston, . . . . .	29 Common St.
Munn, Samuel M. . . .	II.	Louisville, Ky., . . .	Jamaica Plain.
Munroe, James P. . . .	III.A.	Lexington, . . . . .	Lexington.
Osgood, Henry B., <i>A. B.</i>	VI.	Roxbury, . . . . .	2 Guild St.
Pitman, Charles B. . . .	I.	Somerville, . . . . .	Somerville.
Rice, Carrie L. . . . .	V.c.	E. Boston, . . . . .	27 Saratoga St.
Ripley, William T. . . .	II.	Rutland, Vt., . . . . .	79 Waltham St.
Ross, Henry F. . . . .	III.A.	Jamaica Plain, . . . . .	Jamaica Plain.
Ross, John H. . . . .	IX.	Jamaica Plain, . . . . .	Jamaica Plain.
Snelling, Grenville T.	IV.	Boston, . . . . .	273 Clarendon St.
Snow, Walter B. . . . .	II.	Watertown, . . . . .	Watertown.
Walker, Arthur W. . . .	II.	Malden, . . . . .	Malden.

## SECOND YEAR.

NAME.	COURSE.	HOME.	RESIDENCE.
Bryant, George H. . . .	II.	Brockton, . . . . .	Brockton.
Chase, Harvey S. . . .	II.	Haverhill, . . . . .	Haverhill.
Davis, Frank E. . . . .	II.	Somerville, . . . . .	Winter Hill.
Eppendorff, John G. . .	IV.	Brooklyn, N. Y., . . .	116 Pembroke St.
Foran, George J. . . . .	II.	E. Boston, . . . . .	54 Princeton St.
Gale, Horace B. . . . .	II.	Natick, . . . . .	Natick.
Gustin, George H. . . .	III.A.	Dorchester, . . . . .	Dorchester.
Harriman, Frederic O.	I.	Boston, . . . . .	731 Tremont St.

NAME.	HOME.	RESIDENCE.
Hutchings, James M.	II. Boston, . . .	68 Carver St.
Kwong Yung Chung,	II. Canton, China, . . .	96 W. Newton St.
Leonard, H. Ward,	III.A. Cincinnati, O., . . .	136 St. James Ave.
Mansfield, Harvey M.	III.A. Wakefield, . . .	Wakefield.
Richards, Franklin B.	III.A. Somerville, . . .	Somerville.
Scott, Robert W. . .	II. Great Falls, . . .	Hoffman House.
Sears, George G., <i>A.B.</i>	II. Boston, . . .	100 Pinckney St.
Smith, George A. . .	V.C. Arlington, . . .	Arlington.
Tenney, Frank, . .	III.A. Boston, . . .	64 Rutland St.
Tompkins, Chas. H., Jr.	III.A. Staten Island, N. Y.,	317 Marlboro St.
Underwood, George R.	V.A. Boston, . . .	643 Tremont St.
Wild, Herbert H. . .	V.C. E. Somerville, . . .	E. Somerville.

NAME.	HOME.	RESIDENCE.
Appleton, Charles B. . . .	Cambridge, . . .	Cambridge.
Bartlett, T. Harris, . . .	Portsmouth, N. H.,	Milton.
Bennett, Henry D. . . .	Brookline, . . .	Brookline.
Boardman, Henry A. . . .	Melrose, . . .	Melrose.
Bothfeld, Charles C. . . .	Newton, . . .	Newton.
Bridgman, Alfred F. . . .	Hyde Park, . . .	Hyde Park.
Brown, Alice J. . . .	Roxbury, . . .	Hayward St.
Bunce, Walter H. . . .	Hartford, Conn.,	116 Pembroke St.
Callahan, Wm. K. . . .	Dayton, Ohio, . . .	371 Columbus Ave.
Carven, Christopher J. . . .	So. Boston, . . .	125 Broadway.
Chase, Roscoe L. . . .	Lewell, . . .	Lowell.
Cheney, Edward M. . . .	Manchester, Conn.,	116 Boylston St.
Codman, Henry S. . . .	Brookline, . . .	Brookline.
Dearborn, Samuel S. . . .	Harrison Square, . . .	Harrison Square.
Doane, Alfred O. . . .	Cambridgeport, . . .	Cambridgeport.
du Pont, T. Coleman, . . .	Louisville, Ky., . . .	78 Temple St.
Emery, Herbert C. . . .	Indianapolis, Ind., . . .	Newton Centre.
Fitch, Alfred L. . . .	Chicago, . . .	29 Milford St.
French, Geo. L. R. . . .	E. Boston, . . .	203 Lexington St.
Gill, Augustus H. . . .	Canton, . . .	Canton.
Goodrich, Robert R. . . .	Westfield, N. J., . . .	801 E dway, So. B.
Haines, Frank M. . . .	Roxbury, . . .	Townsend St.
Hammett, Hiram G. . . .	Somerville, . . .	Somerville.
Heywood, George H. . . .	Gardner, . . .	351 Harvard St., C.
Holder, James G. . . .	Lynn, . . .	Lynn.

## STUDENTS.

NAME.	HOME.	RESIDENCE.
Horton, Isaac C. . . .	Canton, . . . .	Ponkapoag, Canton.
Ilsley, Samuel M. . . .	Milwaukee, Wis., . . . .	151 Worcester St.
Jarvis, George T. . . .	Erie, Pa., . . . .	60 Chandler St.
Knapp, George F. . . .	Cambridge, . . . .	66 Thorndike St.
Kwong Hein Chow, . . . .	Canton, China, . . . .	96 W. Newton St.
Kwong King Young, . . . .	Canton, China, . . . .	67 Dartmouth St.
Lauriat, Anselm A. . . .	Medford, . . . .	Medford.
Mead, Frederic S. . . .	W. Acton, . . . .	W. Acton.
Mellen, Edwin D. . . .	Cambridgeport, . . . .	Cambridgeport.
Newell, Frederick H. . . .	Bradford, Pa., . . . .	Brookline.
O'Brien, William L., Jr., . . . .	Cincinnati, O., . . . .	11 Beacon St.
Otis, Herbert F. . . .	Boston, . . . .	139 Beacon St.
Penny, Junius H. . . .	Wilmington, N. C., . . . .	289 Columbus Ave.
Perin, Clifford, . . . .	Cincinnati, O., . . . .	11 Beacon St.
Pratt, A. Stuart, . . . .	W. Newton, . . . .	W. Newton.
Puffer, William L. . . .	Roxbury, . . . .	92 Winthrop St.
Purinton, Arthur J. . . .	Lynn, . . . .	Lynn.
Robinson, Charles S. . . .	Wareham, . . . .	613 Tremont St.
Robinson, Theodore W. . . .	Wareham, . . . .	613 Tremont St.
Rotch, A. Lawrence, . . . .	Boston, . . . .	3 Commonwealth Ave.
Ryder, Josiah P. . . .	E. Boston, . . . .	25 Saratoga St.
Sedgwick, Edward, . . . .	Stockton, Cal., . . . .	22 St. Charles St.
Sik, Yau Foke, . . . .	Amoy, China, . . . .	370 Columbus Ave.
Smith, Frederic L. . . .	Concord, N. H., . . . .	17 Wellington St.
Smith, Wallace B. . . .	Philadelphia, Pa., . . . .	70 W. Cedar St.
Stuart, Frederic M. . . .	Cambridge, . . . .	90 Hancock St.
Sturgis, Elliot T. . . .	Staten Island, N. Y. . . .	307 Beacon St.
Sung Mun Wai, . . . .	Macao, China, . . . .	11 Yarmouth St.
Torie, Tadabumi, . . . .	Tokio, Japan, . . . .	Andover.
Tyler, Harry W. . . .	Ipswich, . . . .	Ipswich.
Tyng, Se Chung, . . . .	Canton, China, . . . .	370 Columbus Ave.
Wakefield, Frank H. . . .	Hopkinton, . . . .	Hopkinton.
Ward, Nahum, . . . .	Roxbury, . . . .	Mt. Seaver Ave.
Whitney, William A. . . .	Boston, . . . .	75 Kendall St.
Whitney, William M. . . .	Winchendon, . . . .	24 Somerset St.
Williams, Francis C., Jr., . . . .	Roxbury, . . . .	28 H'ld Park Ave.
Yang Seu Nam, . . . .	Canton, China, . . . .	370 Columbus Ave.



*SPECIAL STUDENTS.*

The abbreviations used in the following list, which includes all students who are not in the full regular courses, are:—

Arch.	Architecture.	Eng.	English.	Mil.	Military Drill.
Astr.	Descriptive Astronomy.	Fr.	French.	Min.	Mineralogy.
Biol.	Biology.	Geol.	Geology.	Min. Eng.	Mining Engineering.
Bot.	Botany.	Germ.	German.	Persp.	Perspective.
Build. M.	Building Materials.	Ital.	Italian.	S. S.	Shadows and Shadows.
Chem.	Chemistry.	Math.	Mathematics.	Shop.	Shopwork.
Civ. Eng.	Civil Engineering.	Mech.	Mechanics.	Span.	Spanish.
Draw.	Drawing.	Mech. Eng.	Mechanical Engineering.	Ster.	Stereotomy.
Desc. Geom.	Descriptive Geometry.	Met.	Metallurgy.	Zool.	Zoology.
		Met. Lab.	Metallurgical Laboratory.		

NAME.	HOME.	RESIDENCE.
Alexander, Winthrop.	Roxbury, . . . .	Waban St.
Phys., Math., Eng., Germ., Astr., Civil Eng., Desc. Geom.		
Atkinson, Charles H. . . .	Brookline, . . . .	Brookline.
Draw., Eng., Germ., Shop.		
Baldwin, H. Furlong, . . . .	Waterbury, Md., . . . .	504 Columbus Ave.
Chem., Math., Eng., Shop., Draw.		
Bardwell, Herbert T. . . . .	Springfield, . . . .	3 St. Charles St.
Phys., Math., Eng., Germ., Astr., Civil Eng., Desc. Geom.		
Barnes, Amy, . . . . .	Northboro, . . . .	Northboro.
Chem.		
Blancher, Mary A., . . . .	Boston, . . . . .	126 W. Newton St.
Chem.		
Bonillas, Ygnacio, . . . . .	Mexico, . . . . .	308 Columbus Ave.
Chem., Fr., Math., Draw.		
Boon, Harry M. . . . .	Fort Wayne, Ind., . . . .	Woburn.
Desc. Geom., Math., Mech. Eng.		
Boyden, Dwight F. . . . .	Boston, . . . . .	Hotel Huntington.
Desc. Geom., Mech. Eng., Draw., Shop.		
Brackett, Albert C. . . . .	Newton, . . . . .	Newton.
Arch., Math., Phys., Geol.		
Bryant, Cushing M. . . . .	Deer Isle, Me. . . . .	566 Columbus Ave.
Assay., Chem., Min., Geol., Mining.		
Burgess, Oliver G. . . . .	Boston, . . . . .	73 Montgomery St.
Chem.		
Burgess, Wm. P. . . . .	Dedham, . . . . .	Dedham.
Arch.		
Cabot, George E. . . . .	Brookline, . . . . .	Brookline.
Math., Chem., Mil., Phys.		
Capen, George H. . . . .	Canton, . . . . .	Canton.
Astr., Chem., Germ., Phys., Shop.		
Chandler, Barrett L. . . . .	Roxbury, . . . . .	21 Highland St.
Chem., Fr., Eng., Draw.		
Chase, Charles M. . . . .	Boston, . . . . .	37 W. Newton St.
Arch.		
Cheney, Frank, Jr., . . . .	So. Manchester, Ct., Jamaica Plain.	
Mech., Phys., Chem., Mech. Eng., Draw., Shop.		

NAME.	HOME.	RESIDENCE.
Cheney, Margaret S. . . . Met.	Jamaica Plain, . . .	Jamaica Plain.
Cheong Mon Cham, . . . Mech. Eng., Math., Phys.	Canton, China, . . .	118 Chandler St.
Clark, Grace M. . . . Biol., Bot., Zool., Eng., Germ.	Roxbury, . . .	69 St. James St.
Clemens, Ernest A. . . . Assay., Chem., Min.	Chicago, Ill. . . .	129 Dartmouth St.
Cunner, Harry W. . . . Astr., Phys., Shop., Eng., Draw., Mil.	Manchester, N. H.,	603 Tremont St.
Damon, Ralph H. . . . Math., Chem., Draw., Mil.	Westvale, . . .	70 W. Cedar St.
Darrow, Alfred L. . . . Phys., Eng., Germ., Mech., Geol., Arch., Ital.	Boston, . . .	9 Union Park.
Emery, Francis F., Jr., . . . Mining, Met., Desc. Geom., Draw., Fr.	Boston, . . .	17 Union Park.
Fong, Pah Liang, . . . Math., Chem., Draw., Mil.	Hwangtung, China,	67 Dartmouth St.
Foss, Harry A. . . . Mech., Draw., Shop., Mech. Eng.	Boston, . . .	Jamaica Plain.
Fowle, George E., Jr., . . . Assaying.	Boston, . . .	120 Boylston St.
French, D. Willis, . . . Fr., Draw., Mil.	No. Weymouth, . . .	No. Weymouth.
Frommann, Emil H. . . . Arch.	Chicago, Ill., . . .	97 E. Brookline St.
Fuller, William B. . . . Phys., Math., Eng., Germ., Astr., Civil Eng., Desc. Geom.	Magnolia, . . .	3 St. Charles St.
Furbish, Willard H. . . . Draw.	Berlin Falls, N. H.,	Berlin Falls.
Gardiner, Edward G. . . . Phys., Biol., Bot., Chem., Draw., Zool.	Boston, . . .	289 Marlboro St.
Gibbons, R. Tilden, . . . Phys., Math., Eng., Germ., Surv., Min., Chem.	Boston, . . .	120 Boylston St.
Gilbert, Robert W. . . . Arch.	St. John, N. B., . . .	105 E. Brookline St.
Gilmore, William, . . . Shop., Phys., Astr., Eng.	No. Easton, . . .	No. Easton.
Grant, James, <i>LL.D.</i> . . . Chem.	Leadville, Col., . . .	Hotel Brunswick.
Guild, Charles H. . . . Math., Geom., Phys., Mech. Eng., Shop.	Providence, R. I., . . .	116 Chandler St.
Hacket, Jean A. . . . Arch.	Boston, . . .	93 Warren Ave.
Hale, David C. . . . Arch., Math., Mil.	Ellsworth, Me., . . .	24 Upton St.
Hannaford, Harvey E. . . . Arch.	Cincinnati, O., . . .	84 Chandler St.
Hardon, Robert W. . . . Chem., Fr., Math., Draw.	Newton, . . .	Newton.
Herrick, Rufus T. . . . Math., Draw., Chem., Germ.	Winchester, . . .	Winchester.

## STUDENTS.

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NAME.	HOME.	RESIDENCE.
Hill, Arthur E. . . . . Arch.	Andover, . . . . .	25 Appleton St.
Hill, Fred. E. . . . . Arch.	Red Wing, Minn., . . . . .	121 G St.
Killyer, Edgar C. . . . . Math., Chem., Desc. Geom., Germ., Shop., Eng., Mil.	Virginia City, Nev., . . . . .	309 Columbus Ave.
Hooker, Henry D. . . . . Math., Chem., Eng., Draw.	Boston, . . . . .	65 Worcester St.
Howard, Thomas H. . . . . Arch., Math., Eng., Mil.	Newport, R. I., . . . . .	124 Charles St.
Hunt, Clyde D. V. . . . . Germ., Surv., Phys., Math., Chem., Eng.	Weathersfield, Vt., . . . . .	91 Boylston St.
Hunt, Richard H. . . . . Arch., Eng., Draw., Math.	New York, . . . . .	124 Charles St.
Hunting, Walter C. . . . . Arch., Geol.	Boston, . . . . .	613 Tremont St.
Jackson, David G. . . . . Chem., Min., Phys., Germ.	Newtonville, . . . . .	Newtonville.
Johnson, Frank F. . . . . Surv., Math., Chem., Eng., Mil.	Denver, Col., . . . . .	Brookline.
Johnson, William P. A. B. Chem.	Lynn, . . . . .	Lynn.
Jones, Harry W. . . . . Arch., Shop., Phys.	Shelburne Falls, . . . . .	628 Tremont St.
Jones, Mary E. . . . . Math.	Boston, . . . . .	10 James St.
Kauffman, William, . . . . . Arch.	Bellefontaine, Ohio, . . . . .	112 Dartmouth St.
Kennard, William P. . . . . Chem., Fr., Draw., Mil.	Boston, . . . . .	17 St. James Ave.
Kerr, W. Hall, . . . . . Math., Draw., Chem., Shop.	Raleigh, N. C., . . . . .	Cambridge.
Kingsbury, Harry W. . . . . Chem., Min., Germ.	Seranton, Pa., . . . . .	163 W. Newton St.
Lawton, Mark A., Jr., . . . . . Chem., Min., Germ.	Newton, . . . . .	Newton.
Lewis, Braham J. . . . . Arch., Shop.	Boston, . . . . .	4 Columbus Sq.
Lewis, Lloyd G. . . . . Math., Desc. Geom., Mech. Eng., Phys.	Lynn, . . . . .	Lynn.
Litch, John G. . . . . Astr., Biol., Geol.	Boston, . . . . .	116 Pembroke St.
Loring, Frederic R., S. B. Chem.	Boston, . . . . .	8 Greenwich Park.
McColl, Frank P. . . . . Arch.	Newton, . . . . .	Hoffman House.
Means, James, . . . . . Arch., Shop.	Boston, . . . . .	248 Commonwh Av.
Munger, Lillian M. . . . . Eng.	Kent's Hill, . . . . .	29 Buckingham St.
Murphy, Kate M. . . . . Chem.	Roxbury, . . . . .	50 Regent St.

NAME.	HOME.	RESIDENCE.
Neff, Harry M. . . . . Mech., Phys., Eng., Germ., Geol., Arch., S. S.	Denver, Col., . . .	371 Columbus Ave.
Newell, Jeanie H. . . . . Phys., Chem.	Cambridge, . . .	Cambridge.
Nichols, Edward, . . . . Arch.	Cohasset, . . . .	Cohasset.
Nicholson, W. H. . . . . Assaying.	Salina, Col., . . .	Dorchester.
Noble, Frank C. . . . . Mech., Phys., Civ. Eng., Met.	E. Boston, . . .	106 Lexington St.
Noble, Orville R. . . . . Math., Draw., Shop., Chem., Eng.	Granville, . . .	289 Columbus Ave.
Norris, George H. . . . . Chem., Draw.	Milwaukee, Wis., .	112 Dartmouth St.
Northend, W. W. . . . . Arch.	Salem, . . . .	Salem.
Paddock, Benjamin S. . . . Astr., Arch., Eng., Germ., Math., Desc. Geom.	Omaha, Neb. . . .	55 Chestnut St.
Page, Annie L. . . . . Mineral.	Danvers, . . . .	Danvers.
Palmer, Mary T. . . . . Min.	Roxbury, . . . .	Bellevue St.
Patch, Oscar L. . . . . Mech., Eng., Draw.	Lexington, . . . .	Lexington.
Prentice, Arthur B. . . . . Arch.	W. Killingly, Conn.,	22 Buckingham St.
Price, Walter B. . . . . Chem., Math., Mil., Eng., Draw.	Jefferson City, Mo.,	317 Marlboro St.
Ramsden, Albert H. . . . . Arch.	Lawrence, . . . .	61 Warren St.
Reynolds, George W. . . . . Draw.	Providence, R. I.	
Rich, Charles E. . . . . Arch.	So. Boston, . . . .	847 Fourth St.
Rogers, James S., Jr., . . . Arch.	Baltimore, Md., . .	298 Columbus Ave.
Sawyer, Frederic J. . . . . Math., Eng., Chem., Germ., Draw., Shop., Mil.	Dover, N. H., . . .	Hotel Bellevue.
Schofield, Charles E. . . . . Draw.	Macon, Ga., . . . .	213 W. Canton St.
Sharp, Herbert H. . . . . Chem., Mech. Eng., Shop., Draw.	Salem, O., . . . .	129 Dartmouth St.
Shepley, George F. . . . . Arch., Mech., Phys.	St. Louis, Mo., . .	286 Beacon St.
Shope, Henry B. . . . . Arch., Fr., Math.	Staten Island, N. Y.,	165 W. Canton St.
Snedeker, Charles A. . . . . Arch., Eng.	Brooklyn, N. Y., . .	371 Columbus Ave.
Spalding, Charles E. . . . . Fr., Eng., Math., Shop.	Lawrence, . . . .	Lawrence.
Stantial, Amy M. . . . . Chem., Phys., Germ.	Melrose, . . . .	Melrose.

## STUDENTS.

19

NAME.	HOME.	RESIDENCE.
Stebbins, Alfred, Jr., Mech., Chem., Phys., Min.	Forest Hills,	Forest Hills.
Swasey, William A. Arch., Shop., Germ.	New York, N. Y.,	5 St. James Ave.
Thompson, Edgar B. Shop., S. S., Desc. Geom., Math., Phys., Astr.	Woburn,	Woburn.
Tryon, Thomas, Arch., Geol.	Hartford, Conn.,	116 Pembroke St.
Tuxbury, Helen, A.B. Chem., Min., Biol., Geol.	Charlestown,	55 Warren St.
Tyler, Artemas L. Chem., Germ., Met.	Lowell,	Lowell.
Walkley, Edwin N. Shop., Mech. Eng., Draw.	Plantsville, Conn.,	Boston.
Walsh, Frederick T. Chem.	Lowell,	Dorchester.
Walworth, John P. Math., Draw., Shop.	Lawrence,	Lawrence.
Warren, George E. Eng., Math., Mech., Eng., Shop.	Exeter, N. H.,	Exeter, N. H.
Welch, Edward M. Arch., Geol.	Hartford, Conn.,	116 Pembroke St.
Wescott, James H. Arch.	Saratoga Springs, N.Y.	323 Columbus Ave.
White, Anthony C. Phys., Eng., Germ., Mech., Chem., Biol.	Taunton,	123 Chelsea St.
Whitney, Asa W. Germ., Chem., Math., Shop., Draw.	Philadelphia, Pa.,	16 Ashburton Place.
Willard, John W. Draw.	Boston,	57 Tremont St.
Woods, Harry F. Astr., Desc. Geom., Germ., Arch., Draw.	San Francisco, Cal.,	504 Columbus Ave.
Woodward, Lizzie J. Bot., Eng., Zool., Biol.	Boston,	5 Lambert Ave.

## STUDENTS IN THE SCHOOL OF MECHANIC ARTS.

## ADVANCED COURSE.

NAME.	HOME.	RESIDENCE.
Barnard, M. Pennock, sp.	Kennett Sq., Pa.,	36 Yarmouth St.

## SECOND YEAR.

NAME.	HOME.	RESIDENCE.
Bent, Elmer M. . . . sp.	Cochituate,	Cochituate.
Choate, Parker C. . . .	Salem,	Salem.
Coburn, George A. . . .	Hopkinton,	Hopkinton.
Codman, Charles F. sp.	Boston,	347 Columbus Ave.
Dorsey, James T. . . .	Hartford, Conn.,	12 Ferdinand St.

## STUDENTS.

NAME.	HOME.	RESIDENCE.
Douglass, Malcolm, Jr., sp.	Andover, . . .	Andover.
Evans, Albert D. . . .	Boston, . . . .	254 Cabot St.
Frost, Walter E. . . .	Neponset, . . . .	Neponset.
Hopkins, Charles F. . .	Park Ridg <sup>g</sup> , N. J.,	Waltham.
Kelley, Ernest F. . . sp.	Bath, Me., . . . .	591 Tremont St.
Keyes, John M. . . . sp.	Concord, . . . .	Concord.
Philbrick, Arthur, . . sp.	Newton Centre,	Newton Centre.
Pope, Harry M. . . . .	Boston, . . . . .	96 Boylston St.
Robinson, Edward S. sp.	Roxbury, . . . .	50 Vernon St.
Sise, Lyman, . . . . .	Medford, . . . .	Medford.
Stephenson, Charles H. .	Lynn, . . . . .	Lynn.
Ward, Harold . . . . sp.	Boston, . . . . .	62 Commonw'lth Av.

## FIRST YEAR.

NAME.	HOME.	RESIDENCE.
Adams, Arthur E. . . .	Greenville, N. H.,	Belmont.
Backer, Clarence A. sp.	Melrose, . . . . .	Melrose.
Berg, George H. . . . .	Medford, . . . . .	Medford.
Bigelow, Alanson, 3rd, .	Cambridge, . . . .	265 Harvard St.
Cavanagh, James E. sp.	Braintree, . . . .	Braintree.
Cushing, J. P. . . . . sp.	Boston, . . . . .	168 Beacon St.
Cushman, Solomon F. . .	Monson, . . . . .	7 Ashburton Place.
Cutter, Frank H. . . . .	Auburndale, . . . .	Weston.
Dorchester, Ernest D. sp.	Natick, . . . . .	Natick.
Emerson, Charles B. sp.	Lynn, . . . . .	Lynn.
Emmons, Ervin, . . . .	Boston, . . . . .	27 Perrin St.
Foster, Arthur H. . . . sp.	Andover, . . . . .	Andover.
Frothingham, Mark. . .	Milton, . . . . .	Milton.
Goodwin, Henry K. sp.	Lawrence, . . . .	Lawrence.
Haines, Edward W. . . sp.	N. Hampton, N. H.	57 Appleton St.
Hastings, A. Jarvis . . .	W. Medway, . . . .	W. Medway.
Jordan, Charles R. . . .	Grantville, . . . .	Grantville.
Judkins, Fred. B. . . . .	Merrimac, . . . .	Merrimac.
Motley, George S., <i>A.B.</i> sp.	Lowell, . . . . .	Lowell.
Nutting, Chas. W. . . . sp.	Lynn, . . . . .	Lynn.
Sargent, Thomas T. M. .	E. Somerville, . . .	E. Somerville.
Solger, Parry K. . . . sp.	Washington, D. C.,	124 Charles St.
Stinson, Horace W. sp.	Bath, Me., . . . .	591 Tremont St.
Tweedy, Robert B. . . . .	Milwaukee, Wis., .	151 Worcester St.
Younans, Frank M. . . sp.	Winona, Minn., . .	Boston.

## LOWELL SCHOOL OF DESIGN.

NAME.	HOME.	RESIDENCE.
Aylward, Thomas D. . . .	Milford, . . . .	Milford.
Benner, Winthrop E. . . .	Lowell, . . . .	Lowell.
Boardman, James B. . . .	Saugus, . . . .	Saugus.
Boyd, Mabel J. . . . .	Charlestown, . . . .	12 Prospect St.
Bradford, Marcia A. . . .	Roxbury, . . . .	88 Walnut Ave.
Bryant, Henry F. . . . .	Dorchester, . . . .	Howard Ave.
Capen, Alice R. . . . .	Jamaica Plain, . . . .	Jamaica Plain.
Clough, Alexander B. . . .	Jamaica Plain, . . . .	Jamaica Plain.
Collins, Leila D. . . . .	Boston, . . . .	43 Dwight St.
Cushing, Herbert E. . . .	Charlestown, . . . .	2 Mead St. Court.
Dana, Walter T. . . . .	Boston, . . . .	5 Somerset St.
Dowd, Emma F. . . . .	Boston, . . . .	31 Vernon St.
Drew, Harriet E. . . . .	Charlestown, . . . .	15 Salem St.
Fiske, Laura I. . . . .	Shelburne, . . . .	124 W. Chester P'k.
French, Abbie A. . . . .	Franklin Falls, N. H.	2 Rollins Pl.
French, Grace A. . . . .	Franklin Falls, N. H.	2 Rollins Pl.
Frost, Ella C. . . . .	Peoria, Ill., . . . .	Dorchester.
Gill, Annie A. . . . .	Roxbury, . . . .	25 Fountain St.
Haserick, Arthur A. . . .	Boston, . . . .	256 Commonwealth
Knowles, Florence M. . . .	Boston, . . . .	81 Bower St.
Leeman, Clara M. . . . .	Haverhill, . . . .	Haverhill.
Lewis, Cora E. . . . .	Forest Hills, . . . .	Forest Hills St.
McBarron, John T. . . . .	Boston, . . . .	630 Shawmut Ave.
Oliver, Jean N. . . . .	Boston, . . . .	60 Bowdoin St.
Ordway, Louisa M. . . . .	Jamaica Plain, . . . .	Jamaica Plain.
Pearce, Hannah J. . . . .	W. Roxbury, . . . .	W. Roxbury.
Peck, Harry N. . . . .	Boston, . . . .	727 Shawmut Ave.
Sásse, Andreas, . . . . .	Boston, . . . .	286 Shawmut Ave.
Shattuck, Lucius E. . . . .	Fitchburg, . . . .	Fitchburg.
Sheldon, Fidelity, . . . .	Beverly, . . . .	Beverly.
Simmons, Reuben, . . . .	Boston, . . . .	13 Orange St.
Smyth, Addie K. . . . .	E. Boston, . . . .	1 White St. Place.
Spear, Frank O. . . . .	Jamaica Plain, . . . .	Jamaica Plain.
Tainter, Frank L. . . . .	Newtonville, . . . .	Newtonville.
Tyler, Rebecca, . . . . .	Newtonville, . . . .	Newtonville.
Urban, Albert F. . . . .	Jamaica Plain, . . . .	Jamaica Plain.
Valentine, Lucy W. . . . .	Boston, . . . .	29 Hanson St.
Whitmore, Edward F. . . .	Putnam, Conn., . . . .	109 Chandler St.
Windram, Maud M. . . . .	Boston, . . . .	9 Ashburton Pl.

*SUMMARY.*

Graduate Students, . . . . .	14
Regular Students, fourth year, . . . . .	51
"    "    third " . . . . .	27
"    "    second " . . . . .	20
"    "    first " . . . . .	62
Special Students, . . . . .	113
Students in the School of Mechanic Arts, . . . . .	43
Students in the Lowell School of Practical Design, . . . . .	39
	<hr/>
	349
Deduct names counted twice, . . . . .	14
	<hr/>
Total, . . . . .	335



## COURSES OF INSTRUCTION.

The Massachusetts Institute of Technology provides a series of scientific and literary studies and practical exercises, embracing pure and applied mathematics, the physical and natural sciences with their applications, drawing, the English language, history and political economy, French, and German. These studies and exercises are so arranged as to offer a liberal and practical education in preparation for active pursuits, as well as a thorough training for most of the scientific professions.

Ten regular courses, further details of which will be found on pages 25-36, have been established, as follows:—

- I. A COURSE IN CIVIL AND TOPOGRAPHICAL ENGINEERING.
- II. “ “ “ MECHANICAL ENGINEERING.
- III. “ “ “ MINING ENGINEERING,  
OR GEOLOGY AND MINING.
- IV. “ “ “ BUILDING AND ARCHITECTURE.
- V. “ “ “ CHEMISTRY.
- VI. “ “ “ METALLURGY.
- VII. “ “ “ NATURAL HISTORY.
- VIII. “ “ “ PHYSICS.
- IX. AN ELECTIVE COURSE.
- X. A COURSE IN SCIENCE AND LITERATURE.

The first five of these are of a distinctly professional character, the one in Metallurgy is similar to that in Chemistry, but has more particular reference to the production and

working of the metals. The course in Natural History affords an appropriate general training for those whose ulterior object is the special pursuit of geology, mineralogy, botany, zoology, pharmacy, or rural economy. It is specially suitable for those who intend subsequently to enter the medical profession. The course in physics is based on the mathematical and physical sciences, and offers a suitable preparation for persons desirous of fitting themselves to teach physical science, as well as for those desiring to enter upon the pursuit of the various practical applications of Physics, as in electrical engineering, or in making physical tests of materials. The Elective Course requires an amount of scientific study equivalent to that prescribed in any of the others, but of a more general nature; and is established for such as may not desire to adopt a distinctly scientific profession. The course in Science and Literature embraces a larger element of literary and historical study than the other courses, and is specially intended to furnish a liberal preparation for business pursuits.

In all the courses it is intended to secure to the student a liberal culture, as well as the more strictly technical education which may be his chief object.

Each of these courses extends through four years, and for proficiency in any one of them the degree of S. B., Bachelor of Science, is conferred.

Students who find it advantageous to take fewer studies in any year than are prescribed in a single course may continue in the school a fifth year to make up the studies required for a degree.

Advanced courses of study may be pursued, and the granting of the degree of Doctor of Science has been authorized by a vote of the Corporation.

Provision is also made for persons who desire to pursue special portions only of any of the regular courses.

At the request of the Woman's Education Association of Boston, and with their generous co-operation, special laboratories have been provided for the instruction of women. The

design is to afford them facilities for the study of Chemical Analysis, Industrial Chemistry, Mineralogy, and Biology. The instruction is arranged for such students as may be able to devote their whole time to the work, as well as for those who, by reason of other engagements, can spend only a few hours a week in these exercises. Instruction will also be given to women in other subjects so far as suitable arrangements can be made for them.

The Institute also provides afternoon and evening courses of instruction, scientific and literary, open to both sexes. At present these courses are free, being supported by the Trustee of the Lowell Institute. Fuller details are given under Free Courses of Instruction.

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## REGULAR COURSES.

### ALL COURSES.—FIRST YEAR.

#### FIRST TERM.

Algebra continued.  
 Solid Geometry.  
 General Chemistry.  
 Chemical Laboratory.  
 Rhetoric.  
 English Composition.  
 French.  
 Mechanical Drawing.  
 Free Hand Drawing.  
 Military Drill.

#### SECOND TERM.

Plane and Spherical Trigonometry  
 General Chemistry.  
 Qualitative Analysis.  
 Chemical Laboratory.  
 English History.  
 English Literature.  
 French.  
 Mechanical Drawing.  
 Free Hand Drawing.  
 Military Drill.

## I. CIVIL ENGINEERING.

## SECOND YEAR.

## FIRST TERM.

Use of Instruments.  
 Surveying.  
 Field Practice.  
 Pen and Colored Topography.  
 Plotting from notes.  
 Analytic Geometry.  
 Descriptive Geometry.  
 Physics.  
 Descriptive Astronomy.  
 English History and Literature.  
 German.

## SECOND TERM.

Railroad Curves.  
 Levelling.  
 Field Practice.  
 Plan Drawing.  
 Stereotomy.  
 Differential Calculus.  
 Physics.  
 Physical Geography and Dynamical Geology.  
 English History and Literature.  
 German.

## THIRD YEAR.

## FIRST TERM.

Earth Work.  
 Location and Construction of Roads, Railroads, and Canals.  
 Field Practice.  
 Drawing from Models and actual Structures.  
 Integral Calculus.  
 General Statics.  
 Stresses in Frames.  
 Physics; Lectures, and Laboratory Work.  
 Lithology and Structural Geology.  
 Zoology.  
 Palæontology.  
 Constitutional History.  
 German.

## SECOND TERM.

Hydraulics.  
 Water supply.  
 Drainage.  
 River and Harbor Improvements.  
 Field Practice.  
 Projections and Perspective.  
 Bridges and Roofs (Descriptive).  
 Strength of Materials.  
 General Laws of Kinematics and Dynamics.  
 Physical Laboratory.  
 Historical Geology.  
 Political Economy.  
 German.

## FOURTH YEAR.

## FIRST TERM.

Geodesy.  
 Practical Astronomy.  
 Hydrography.  
 Structures of Stone, Wood, and Iron.  
 Designing of Roofs and Bridges.  
 Structure Drawing.  
 Locomotive Engines.  
 Strength of Materials completed.  
 Metallurgy.  
 Applied Physics.

## SECOND TERM.

Structures of Stone, Wood, and Iron.  
 Graphical Statics.  
 Pumping Engines.  
 Water Wheels.  
 Engineering Projects.  
 Machine Drawing.  
 Dynamics completed.  
 Thesis Work.  
 Building Materials.

## II. MECHANICAL ENGINEERING.

## SECOND YEAR.

## FIRST TERM.

Setting of Machines.  
 Transmission and Production of  
 Power.  
 Machine Drawing.  
 Carpentry (shopwork).  
 Analytic Geometry.  
 Descriptive Geometry.  
 Physics.  
 Descriptive Astronomy.  
 English History and Literature.  
 German.

## SECOND TERM.

Kinematics of Machines.  
 Graphical Kinematics of Machines.  
 Machine Drawing.  
 Pattern and Foundry Work (shop-  
 work).  
 Differential Calculus.  
 Physics.  
 Physical Geography and Dynam-  
 ical Geology.  
 English History and Literature.  
 German.

## THIRD YEAR.

## FIRST TERM.

Combustion of Fuel.  
 Steam Generators and Steam En-  
 gines.  
 Machine Drawing.  
 Steam Engineering Laboratory.  
 Blacksmithing (shopwork).  
 Integral Calculus.  
 General Statics.  
 Stresses in Frames.  
 Physics; Lectures, and Laboratory  
 Work.  
 Constitutional History.  
 German.

## SECOND TERM.

Machine Design.  
 Elements of Thermodynamics.  
 Machine Drawing.  
 Steam Engineering Laboratory.  
 Chipping and Filing (shopwork).  
 Perspective.  
 Strength of Materials.  
 General Laws of Kinematics and  
 Dynamics.  
 Physical Laboratory.  
 Political Economy.  
 German.

## FOURTH YEAR.

## FIRST TERM.

Machine Design.  
 Measurement and Regulation of  
 Power.  
 Machine Drawing.  
 Abstracts from Memoirs.  
 Steam Engineering Laboratory.  
 Blacksmithing (shopwork).  
 Strength of Materials completed.  
 Hydraulics.  
 Metallurgy.

## SECOND TERM.

Thermodynamics of Steam and  
 other Heat Engines.  
 Pumping Engines, Hydraulic Mo-  
 tors, Machines, and Regulators.  
 Steam Engineering Laboratory.  
 Machine Design.  
 Machine Drawing.  
 Engine Lathe work (shopwork).  
 Hydraulics.  
 Dynamics completed.  
 Stability of Structures.  
 Building Materials.  
 Thesis Work.

## III. MINING ENGINEERING.— A.

## SECOND YEAR.

## FIRST TERM.

Blowpipe Analysis, Crystallography, and Determinative Mineralogy.  
 Qualitative Chemical Analysis, Lectures, and Laboratory work.  
 Use of Surveying Instruments.  
 Surveying.  
 Field Practice.  
 Drawing.  
 Analytic Geometry.  
 Physics.  
 German.

## SECOND TERM.

Quantitative Chemical Analysis, Lectures and Laboratory work.  
 Differential Calculus.  
 Physics.  
 Physical Geography and Dynamical Geology.  
 English History and Literature.  
 German.

## THIRD YEAR.

## FIRST TERM.

Quantitative Chemical Analysis.  
 Mining Engineering, Sinking, Timbering, Hoisting, Pumping, Ventilating, &c.  
 Integral Calculus.  
 General Statics.  
 Stresses in Frames.  
 Physics; Lectures and Laboratory work.  
 Lithology.  
 Constitutional History.  
 German.

## SECOND TERM.

Mining Engineering continued.  
 Assaying by Fire and by Wet Methods.  
 Quantitative Chemical Analysis.  
 Strength of Materials.  
 General Laws of Kinematics and Dynamics.  
 Physical Laboratory.  
 Historical Geology.  
 Political Economy.  
 German.

## FOURTH YEAR.

## FIRST TERM.

Quantitative Chemical Analysis.  
 Mining Laboratory:—work upon Gold, Silver, Copper, and Lead Ores in quantity.  
 Metallurgy, Lectures.  
 Drawing.  
 Strength of Materials completed.  
 Dynamics completed.  
 Memoirs.

## SECOND TERM.

Quantitative Chemical Analysis.  
 Mining Laboratory as in 1st term.  
 Ore dressing, Lectures.  
 Welding and Tempering (shop-work).  
 Thesis Work.  
 Building Materials.

For Course III.— B see next page.

## III. GEOLOGY AND MINING.—B.

## SECOND YEAR.

## FIRST TERM.

Blowpipe Analysis, Crystallography, and Determinative Mineralogy.  
 Qualitative Chemical Analysis, Lectures, and Laboratory work.  
 Use of Surveying Instruments.  
 Surveying.  
 Field Practice.  
 Drawing.  
 English History and Literature.  
 Physics.  
 German.

## SECOND TERM.

Qualitative Chemical Analysis, Lectures, and Laboratory Work.  
 Physics.  
 Physical Geography, and Dynamical Geology.  
 Zoology.  
 Palæontology.  
 Botany.  
 English History and Literature.  
 German.

## THIRD YEAR.

## FIRST TERM.

Mining Engineering, Sinking, Timbering, Hoisting, Pumping, Ventilating, &c.  
 Quantitative Chemical Analysis.  
 Zoology.  
 Palæontology.  
 Physics; Lectures, and Laboratory work.  
 Lithology and Chemical Geology.  
 Constitutional History.  
 German.

## SECOND TERM.

Mining Engineering continued.  
 Assaying by Fire and by Wet Methods.  
 Quantitative Chemical Analysis.  
 Industrial Chemistry.  
 Physical Laboratory.  
 Historical Geology,  
 Political Economy.  
 German.

## FOURTH YEAR.

## FIRST TERM.

Quantitative Chemical Analysis.  
 Mining Laboratory:—work upon Gold, Silver, Copper, and Lead Ores in quantity.  
 Metallurgy, Lectures.  
 Drawing.  
 Applied Physics.  
 Memoirs.

## SECOND TERM.

Quantitative Chemical Analysis.  
 Mining Laboratory as in 1st term.  
 Ore dressing, Lectures.  
 Welding and Tempering (shop-work).  
 Thesis Work.  
 Building Materials.

## IV. ARCHITECTURE.

## SECOND YEAR.

## FIRST TERM.

Greek and Roman Architectural History.  
 The Orders and their applications.  
 Drawing.  
 Tracing and Sketching.  
 Analytic Geometry.  
 Physics.  
 Descriptive Geometry.  
 Descriptive Astronomy.  
 English History and Literature.  
 German.

## SECOND TERM.

Mediaeval Architectural History.  
 Perspective.  
 Blackboard Drawing.  
 Drawing.  
 Sketching.  
 Differential Calculus.  
 Physics.  
 Botany, Systematic, and Structural.  
 Physical Geography and Dynamical Geology.  
 English History and Literature.  
 German.

## THIRD YEAR.

## FIRST TERM.

Theory of Decoration ;  
 Color, Form and Proportions ;  
 Conventionalization ;  
 Symbolism.  
 Original Design.  
 Sketching.  
 Specifications ; Masonry, etc.  
 Integral Calculus.  
 General Statics.  
 Stresses in Frames.  
 Lithology and Structural Geology.  
 Physics ; Lectures, and Laboratory work.  
 Constitutional History.  
 German.

## SECOND TERM.

Modern Architectural History.  
 The Decorative Arts ; Stained Glass, Fresco Painting, Tiles, Terra Cotta, etc.  
 Original Design.  
 Sketching.  
 Specifications ; Plumbing, etc.  
 Strength of Materials.  
 General Laws of Kinematics and Dynamics.  
 Bridges and Roofs (Descriptive).  
 Stereotomy.  
 Physical Laboratory.  
 Political Economy.  
 German.

## FOURTH YEAR.

## FIRST TERM.

The History of Ornament.  
 Blackboard Drawing.  
 Original Design.  
 Sketching.  
 Specifications ; Carpentry, etc.  
 Strength of Materials completed.  
 Stability of Structures.  
 Carpentry (shopwork).  
 Applied Physics.

## SECOND TERM.

The Theory of Architecture.  
 Style and Composition.  
 Original Design.  
 Sketching.  
 Specifications ; Contracts, etc.  
 Building Materials.  
 Flow of Gases.  
 Thesis Work.

The lectures on Mediaeval and Modern History, those on Ornament and Decoration, and those on Specifications are given in alternate years, two classes taking them together.



## V. CHEMISTRY.—A.

## SECOND YEAR.

## FIRST TERM.

Qualitative Analysis, Lectures, and Laboratory work.  
 Blowpipe Analysis, Crystallography, and Determinative Mineralogy.  
 Analytic Geometry.  
 Physics.  
 English History and Literature.  
 German.

## SECOND TERM.

Quantitative Analysis, Lectures, and Laboratory work.  
 Chemical Philosophy.  
 Differential Calculus.  
 Physics.  
 English History and Literature.  
 German.

## THIRD YEAR.

## FIRST TERM.

Quantitative Analysis, Laboratory work.  
 Quantitative Analysis, Special Methods.  
 Work with the Microscope.  
 Physics; Lectures, and Laboratory work.  
 Constitutional History.  
 German.

## SECOND TERM.

Quantitative Analysis, Laboratory work.  
 Industrial Chemistry.  
 Drawing.  
 Physical Geography.  
 Dynamical Geology.  
 Physical Laboratory.  
 Political Economy.  
 German.

## FOURTH YEAR.

## FIRST TERM.

Organic Chemistry, Lectures.  
 Organic Chemistry, Laboratory work.  
 Metallurgy, Lectures.  
 Abstracts of Memoirs.  
 Applied Physics.  
 Optional Studies.

## SECOND TERM.

Studies for this term, including Thesis work, will be specially assigned to each student.

For Courses B and C, see next page.

## V. CHEMISTRY.—B and C.

## SECOND YEAR.

## FIRST TERM.

Qualitative Analysis, Lectures, and Laboratory work.  
 Blowpipe Analysis, Crystallography, and Determinative Mineralogy.  
 Descriptive Astronomy.  
 Physics.  
 English History and Literature.  
 German.

## SECOND TERM.

Quantitative Analysis, Lectures, and Laboratory work.  
 Chemical Philosophy.  
 Botany, Systematic and Structural.  
 Physical Geography and Dynamical Geology.  
 Physics.  
 English History and Literature.  
 German.

## THIRD YEAR.

## FIRST TERM.

Quantitative Analysis, Laboratory work.  
 Quantitative Analysis, Special Methods.  
 Biology.  
 Physics; Lectures, and Laboratory work.  
 Lithology.  
 Constitutional History.  
 German.

## SECOND TERM.

Quantitative Analysis, Laboratory work.  
 Industrial Chemistry, Lectures.  
 Drawing.  
 Physical Laboratory.  
 Historical Geology.  
 Political Economy.  
 German.

## FOURTH YEAR.—FIRST TERM.

## COURSE B.

Organic Chemistry, Lectures.  
 Organic Chemistry, Laboratory work.  
 Metallurgical Laboratory.  
 Metallurgy, Lectures.  
 Abstracts of Memoirs.  
 Applied Physics.  
 Optional Studies.

## COURSE C.

Organic Chemistry, Lectures.  
 Organic Chemistry, Laboratory work.  
 Industrial Chemistry, Laboratory work.  
 Metallurgy, Lectures.  
 Abstracts of Memoirs.  
 Applied Physics.  
 Optional Studies.

## FOURTH YEAR.—SECOND TERM.

Studies for this term, including Thesis work, will be specially assigned to each student.

Candidates for the degree in Chemistry may elect either of the courses A, B, or C. Course A is for those who wish to continue the study of mathematics beyond the first year. Course B is for those who prefer a larger amount of the natural sciences; and Course C for those whose aim is the pursuit of Industrial Chemistry.

## VI. METALLURGY.

## SECOND YEAR.

## FIRST TERM.

Blowpipe Analysis, Crystallography, and Determinative Mineralogy.  
 Qualitative Analysis, Lectures.  
 Qualitative Analysis, Laboratory work.  
 Descriptive Astronomy.  
 Physics.  
 English History and Literature.  
 German.  
 Drawing.

## SECOND TERM.

Quantitative Analysis; Lectures, and Laboratory work.  
 Chemical Philosophy.  
 Botany.  
 Zoology and Palæontology.  
 Physical Geography and Dynamical Geology.  
 Physics.  
 English History and Literature.  
 German.

## THIRD YEAR.

## FIRST TERM.

Quantitative Analysis Lectures.  
 Quantitative Analysis, Laboratory work.  
 Biology.  
 Physics; Lectures, and Laboratory work.  
 Lithology and Geology.  
 Drawing.  
 Constitutional History.  
 Zoology.  
 Palæontology.  
 German.

## SECOND TERM.

Quantitative Analysis, Laboratory work.  
 Industrial Chemistry Lectures.  
 Physical Laboratory.  
 Historical Geology.  
 Political Economy.  
 German.  
 Assaying.

## FOURTH YEAR.

## FIRST TERM.

Quantitative Analysis, Laboratory work.  
 Metallurgy.  
 Metallurgical Laboratory:—Work upon Gold, Silver, Copper, and Lead Ores in quantity.  
 Drawing.  
 Applied Physics.  
 Blacksmithing (shopwork).  
 Abstracts of Memoirs.

## SECOND TERM.

Quantitative Analysis, Laboratory work.  
 Metallurgy and Ore-dressing.  
 Mining Laboratory as in 1st term.  
 Thesis Work.  
 Building Materials.  
 Drawing.

## VII. NATURAL HISTORY.

## SECOND YEAR.

## FIRST TERM.

Quantitative Analysis, Lectures.  
 Quantitative Analysis, Laboratory work.  
 Blowpipe Analysis, Crystallography, and Determinative Mineralogy.  
 Free Hand Drawing.  
 Descriptive Astronomy.  
 Physics.  
 English History and Literature.  
 German.

## SECOND TERM.

Quantitative Analysis; Lectures, and Laboratory work.  
 Botany.  
 Zoology and Palæontology.  
 Physical Geography and Dynamical Geology.  
 Drawing.  
 Physics.  
 English History and Literature.  
 German.

## THIRD YEAR.

## FIRST TERM.

Quantitative Analysis, or Analytic Geometry.  
 Biology.  
 Cryptogamic Botany.  
 Lithology and Stratigraphical Geology.  
 Physics; Lectures, and Laboratory work.  
 Constitutional History.  
 Zoology and Palæontology.  
 German.

## SECOND TERM.

Historical Geology.  
 Political Economy.  
 Study of Memoirs or Differential Calculus.  
 Anatomical Laboratory.  
 Human Physiology.  
 Field work.  
 Physical Laboratory.  
 German.

A part of the summer vacation is to be devoted to field work in Botany, Zoology, or Geology.

## FOURTH YEAR.

## FIRST TERM.

Special work in  
 Zoology.  
 Biology.  
 Botany or Geology.  
 Drawing with the Microscope.  
 Original Investigation.  
 Physiological Chemistry.  
 Field Work.

## SECOND TERM.

Thesis Work.  
 Laboratory Work.  
 History of Natural Sciences.  
 Industrial Geography.  
 Meteorology.  
 Original Investigation.  
 Field Work.

## VIII. PHYSICS.

## SECOND YEAR.

## FIRST TERM.

Physics, Lectures.  
 Physical Laboratory.  
 Analytic Geometry.  
 Descriptive Geometry.  
 Qualitative Analysis.  
 Descriptive Astronomy.  
 English History and Literature.  
 German.

## SECOND TERM.

Physics, Lectures.  
 Physical Laboratory.  
 Differential Calculus.  
 Quantitative Analysis, Lectures,  
 and Laboratory work.  
 Botany.  
 Physical Geography and Dynamical  
 Geology.  
 English History and Literature.  
 German.  
 General Physics. Reading, deter-  
 mined by particular work of each  
 special student.

## THIRD YEAR.

## FIRST TERM.

Physical Laboratory.  
 General Physics, Optics, or Acous-  
 tics.  
 Integral Calculus.  
 Applied Mechanics.  
 Biology.  
 Chemical Laboratory.  
 Constitutional History.  
 German.

## SECOND TERM.

Physical Laboratory.  
 General Physics, Optics, or Acous-  
 tics.  
 Advanced Physics, Memoirs, etc.  
 History of Physical Sciences.  
 Applied Mechanics.  
 Chemical Philosophy.  
 Political Economy.  
 German.

## FOURTH YEAR.

## FIRST TERM.

Physical Laboratory.  
 General Physics, Electricity.  
 Lantern Projections.  
 History of Physical Science.  
 Practical Astronomy.  
 Applied Mechanics. Thermody-  
 namics, Hydraulics, etc.  
 Chemical Laboratory, Chemical  
 Applications of Physics.

## SECOND TERM.

Physical Research.  
 General Physics, Acoustics, or  
 Optics.  
 Advanced Physics, Memoirs, etc.  
 Principles of Scientific Investiga-  
 tion.  
 Advanced Mathematics.

## IX. THE ELECTIVE COURSE.

## SECOND YEAR.

## FIRST TERM.

Physics.  
 Descriptive Astronomy.  
 English History and Literature.  
 German.

## SECOND TERM.

Physics.  
 Physical Geography, and Dynamical Geology.  
 English History and Literature.  
 German.

## THIRD YEAR.

## FIRST TERM.

Constitutional History.  
 German.

## SECOND TERM.

Political Economy.  
 German.

## FOURTH YEAR.

Studies Elective and subject to the conditions mentioned below.\*

\* Besides the required studies indicated under the second and third years, the student will select, with the approval of the Faculty, from other courses, such subjects as he is prepared to pursue, and which will best suit his ultimate object. Further information in regard to this can be had on application to the Secretary of the Faculty.

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 ADVANCED COURSES.

The particular course of study which a candidate for the degree of Doctor of Science wishes to pursue must be submitted to the Faculty in writing, and must meet their approval.

The minimum term of residence of candidates for this degree will be two years; but occasional short absences, when the time is spent upon professional work by advice of the Faculty, will not be considered as interruptions of the student's residence.

Final examinations will be held, and the candidate will be required to present at least one printed thesis on some subject embraced in his course.

## CONDITIONS OF ADMISSION.

*Regular Courses.* To be admitted as a regular student of the first year's class, the applicant must have attained the age of sixteen years, and must pass a satisfactory examination in:—

Arithmetic (including the metric system of weights and measures);

Algebra, through equations of the second degree;

Plane Geometry.

French—Grammar through irregular verbs\*; and the first two books of Voltaire's "Charles XII.," or an equivalent;

English grammar and composition;

Geography.

In general, the training given in the best high schools and academies will be a suitable preparation for this school.

Students will find their progress in Physics and Chemistry, facilitated by making themselves thoroughly familiar with so much of Physics as is contained in Balfour Stewart's Primer of Physics.

A knowledge of the Latin language is not required for admission; but the study of Latin is strongly recommended to persons who purpose to enter this school, as it gives a better understanding of the various terms used in science, and greatly facilitates the acquisition of the modern languages. Those who intend to take a course in Natural History will find it advantageous to acquire also the elements of Greek.

To be admitted as a regular student of the second year's class, the applicant must be at least seventeen years of age, and, besides passing the examination for admission to the first year's class, must pass a satisfactory examination in the first year's studies; and a like rule applies to the case of applicants for admission into the classes of the succeeding years.

Graduates of Colleges will, in general, be presumed to have the requisite attainments for entering the third year as regular students, and may do so on satisfying the Faculty that they are prepared to pursue the proposed studies to advantage. Such students, if deficient in any of the scientific studies of the first two years, will have opportunities for making them up without extra charge, and will be required to pass an examination in them before entering upon the studies

\* Part I of Otto's French Grammar represents what is required.

of the fourth year. Should they be already proficient in any of the general studies of the third and fourth years, they may be excused from attendance on the exercises in these subjects.

*Special Students* will be allowed to enter special divisions of either of the courses—as, for example, the classes of mathematics, chemistry, physics, drawing, engineering, metallurgy, architecture, natural history, etc.—on giving satisfactory evidence to the Faculty that they are prepared to pursue with advantage the studies selected. Information respecting the requirements for admission to each special course of study may be obtained on application to the Secretary. Examinations for the above-mentioned class of students will be held at the times of the regular entrance examinations as stated below.

An examination for admission to the first year's class will begin at 9 A.M., on the first Tuesday in June, and continue two days. A second examination will begin at 9 A.M., on the Wednesday preceding the last Monday in September, and continue two days. Attendance on both days of either examination is required. Applicants for advanced standing must pass the entrance examination, as given above, and present themselves for further examination at 9 A.M., on the Friday following the second entrance examination.

Applications for admission to the regular or special courses at other times than the above will be received only when sickness or some other equally good cause has prevented attendance on the days prescribed.

*Advanced Courses.* Graduates of the Institute may enter on these courses without examination. Bachelors of Arts, Science, or Philosophy of any other Institution may enter on giving satisfactory evidence, by examination or otherwise, that they are qualified to pursue the course selected.



## METHODS AND APPARATUS OF INSTRUCTION.

*Ordinary Exercises.* Instruction is given by lectures and recitations, and by practical exercises in the field, the laboratories, and the drawing-rooms. Text-books are used in many, but not in all departments. A high value is set upon the educational effect of laboratory practice, drawing, and field work.

*Written Examinations.* Besides oral examination in connection with the ordinary exercises, written examinations are held from time to time.

Near the close of the months of January and May general examinations are held. The standing of the student at these examinations in each distinct subject is reported to his parent or guardian. The examinations of January and May form the basis of admonition or advice from the Faculty in the case of students who are not profiting by their connection with the school. Conditioned students must appear for re-examination at 9 A.M. on the Friday preceding the last Monday in September.

*The Instruction in Mathematics.* Great importance is attached to the study of mathematics both as a means of mental discipline and as affording a necessary basis for farther instruction in the professional courses. In the first year all regular students continue Algebra, and also study Solid Geometry, Plane and Spherical Trigonometry. In the following years, students in most of the courses receive instruction in Analytic Geometry, and in the Differential and Integral Calculus.

*The Instruction in Modern Languages.* The special object of the instruction in French and German is to enable the student to avail himself of the literature in these languages relating to his particular department, since many important sources of information, such as periodicals and works for con-

sultation and reference, are accessible only in French or German. French (some knowledge of which is required for admission to the school) is continued through the first year. German is commenced at the beginning of the second year, and continued for a period of two years. To this extent these languages are studied by all regular students. They may, however, be continued as elective studies.

The elements of Italian and Spanish are taught in optional classes in the third and fourth years, for the benefit of those who may have special reasons for studying those languages.

*The Instruction in English and History.* In this department all regular students receive a course of instruction extending through the first three years in Rhetoric and Criticism, in English Literature, and in Modern History. Practice in English composition is required throughout the course. The study of the History of English Literature is accompanied by the critical reading of English texts, and in the instruction in History particular attention is given to the subjects of Political Science and Political Economy.

*The Instruction in Drawing.* During the first year, instruction is given to all regular students in the principles of Free Hand and Mechanical Drawing, and a large amount of time is devoted to practice in the drawing room, to enable the student to acquire the necessary skill and to prepare him for his future work. In subsequent years, Drawing is continued in connection with the professional studies.

*The Instruction in Descriptive Geometry and Stereotomy.* The exercises in Descriptive Geometry are of two kinds. In the lecture room instruction with models and diagrams is combined with testing the student's knowledge as gained from a text book. In the drawing room the student aims to construct such problems, each week, from the lessons for that week, as shall, during the course, give him practice in all the usual operations belonging to the subject.

The Instruction in Stereotomy is given by means of lectures, and drawing exercises, illustrating a variety of problems in Stone Cutting, on plane, double-curved, and warped surfaces. The application of Descriptive Geometry is extended to the construction of the oblique arch, and winding staircases of various forms, so as to include a large number of useful and practical problems.

*The Instruction in Chemistry.* In the laboratories provision is made for teaching General Chemistry, Qualitative Analysis, Quantitative Analysis, Organic Chemistry, Assaying, Determinative Mineralogy, Metallurgy, and Industrial Chemistry, the use of the blowpipe, as well as the use of the microscope, spectroscope, and other optical apparatus.

Instruction in General Chemistry is given to all regular students by recitations and lectures, and by practical exercises in the laboratory, where every one is provided with a desk and the necessary apparatus, and is required to perform, under the supervision of the professor, a large number of experiments, selected to illustrate the laws of chemical action and the properties and relations of all the more important chemical elements. This is followed by a systematic course of instruction in Qualitative Analysis, with laboratory practice.

In the second year those who require a fuller knowledge of chemistry continue Qualitative Analysis, and take up Chemical Philosophy, Assaying, and Mineralogy with the use of the blowpipe.

The principal subjects of study in the third and fourth years are Volumetric and Gravimetric Analysis, Organic Chemistry, Gas Analysis, the Preparation of Chemical Products, Metallurgy, and Industrial Chemistry. A large portion of the time is allotted to work in the laboratories. In the third year, lectures are given on Quantitative Analysis, and on Physiological and Industrial Chemistry. In the fourth year the lecture room exercises are devoted to Organic Chemistry and Metallurgy. During the last two years the student

is required to make reference to standard works and original memoirs in English, French, and German. Both regular and special students are encouraged to undertake experimental researches, and are assisted in bringing them to useful results.

Arrangements will be made for the accommodation of students who wish to devote themselves to special subjects, such as Toxicology, Food and Water Analysis, Gas Analysis, Dyeing, Tanning, and other chemical arts.

Special provision has been made for giving women ample opportunities for laboratory work in Chemistry, Mineralogy, and Biology. Each study may be pursued by itself, or in connection with studies in other departments of the Institute.

*The Instruction in Physics.* During the second year, the whole subject is discussed in a series of lectures, which are attended by all the regular students. The various branches are treated both mathematically and experimentally. In all cases the theoretical discussion of a question is followed by a full account of its practical application.

The Institute possesses an extensive and constantly increasing collection of physical apparatus.

In the third year, the students enter the *Rogers Laboratory of Physics*, and learn to use the different instruments, and to prove many of the fundamental laws of nature. Some of the experiments, as for instance those with the microscope and spectroscope, and the determination of specific gravities, have a direct value; others are intended to establish certain principles in the mind; others again serve to cultivate manual skill in handling minute or delicate objects; and still others exercise the reasoning faculties, and show how to apply mathematics to concrete problems. This course, therefore, has a use beyond the direct value of the experiments, in the direction of general culture, teaching the student to derive conclusions from observed facts, and showing him the various methods of experimental research.

In the fourth year a portion of the students carry on work

of a more technical nature. Original investigation is stimulated as far as possible, and the result has been a considerable number of published memoirs.

Besides the above, candidates for a degree in Physics pursue the following practical courses:—

Microscopy.—Theory of the microscope; application to study of various objects; test-objects; modes of illumination; applications of polarized light, use of micro-spectroscope; measurement with different forms of micrometer; focal length and angular aperture of objectives; preparation of objects.

Photography.—Methods of photography and its connection with lithography and printing; preparation of baths; taking glass negatives, lantern slides, paper positives; photographs of microscopic objects, of spectra, etc.

Lantern projections.—Sunlight, lime, magnesium, and electric lights; lanterns, condensers, and projecting lenses; projection of views, and of real objects; tanks, chemical and electric decompositions; projection of spectra.

Meteorology.—Atmospheric temperature, pressure, and moisture; velocity of the wind; magnetic elements; electricity of the air.

In addition to the laboratory work, students in this department receive instruction in General Physics throughout the third and fourth years, and gain a familiarity with standard works on various branches of the subject, both in their own and in foreign languages.

Advanced Physics.—As most of the students taking the course in Physics intend to make teaching their profession, a special course is prepared with this object in view, in which each student in turn prepares a particular subject, giving the result of his own or others' researches, and presents it in the form of a scientific memoir or lecture.

Teachers of Physics, and others properly qualified, may enter the laboratory, and take the whole or any part of the above courses.

*The Instruction in Theoretical and Applied Mechanics.*  
This instruction, which is given to all regular students of the

courses of Engineering and Architecture, is begun about December 1st of the third year. During the third year the subjects studied are the composition and resolution of forces, the principles governing the determination of the stresses in the different members of trusses, centre of gravity, parallel projections, moment of inertia of plane surfaces, the ordinary principles of the strength of materials, and the laws of internal stress; also during the last month of the year the general laws of Kinematics and Dynamics are discussed mathematically, such as the equations of uniform and of varying motion, the circular pendulum, the conical pendulum, moment of inertia, radius of gyration, centre of percussion, etc. In this course the methods of the differential and integral calculus are freely used whenever they are the most convenient.

In the fourth year's classes the subjects pursued by the students of each professional course are arranged with reference to the special wants of that course, and then two or more classes are taught together whenever the instruction to be given covers the same ground. This instruction embraces the mathematical principles of the following subjects, viz.: stability of arches and retaining walls, completion of those parts of strength of materials not fully discussed already, as well as further discussion of the stresses in trusses; arched ribs, Hydraulics, Thermodynamics, and special study of Dynamics; the object being to give to the students such knowledge of the mathematical principles of these subjects as they need in order to pursue with advantage the investigations in their own professional departments.

*The Instruction in Civil Engineering* is given by means of lectures and recitations, and by practice in the field and in the drawing rooms. The use of the various instruments for measuring lines and angles, and of the level, plane-table, etc., is taught mainly by actual work in the field. The field-work embraces land surveying, levelling, laying out curves, both circular and parabolic, the detailed survey of a railway line, and staking it out ready for construction, topographical work

with the plane-table, and hydrographical surveying. These surveys are plotted and represented on finished plans. The necessary computations of areas, earth-work, etc. are also made. Instruction in all these subjects is given in the class and drawing rooms.

In the remaining subjects peculiar to this department, as set down in the Course of Instruction, the principal text-books used are Rankine's Civil Engineering, Rankine's Applied Mechanics, Loomis' Practical Astronomy, and Greene's Graphical Methods for Roofs, Bridges, and Arches. The instruction from text-books is supplemented by lectures on many of the subjects, and by suitable explanations and illustrations, together with a series of examples for practice, on which papers are handed in by the students. Considerable time is given to drawing from models and from actual structures, such as abutments, bridges, water-works, etc. Original designs on the same subjects, accompanied with working drawings, are made.

An observatory, erected on the Institute building, from which a large number of Coast Survey stations are visible, is used in connection with the instruction in geodesy. Observations are also made for the determination of the meridian, time, latitude and longitude, in connection with the study of practical astronomy.

*The Instruction in Mechanical Engineering* is given by means of lectures and recitations, and by practice in the drawing rooms, and in the Laboratory of Steam Engineering. Occasional excursions are made to enable the students to witness running machinery, and manufacturing processes.

The instruction in Mill-work treats of placing machinery in the manufactory, and of the distribution, measurement, and regulation of force and power.

The instruction in the Kinematics of Machines treats of the motions and changes of motions which occur in machines, of those problems in machine design which relate to motions that machines are to produce, and of the comparative examination of equivalent mechanisms.

The first term instruction in Machine Design treats of those dimensions of elements of machines that depend upon the force which a pair of elements may transmit, or upon the work-shop processes by which the elementary parts are produced. It also involves the application of principles of kinematics and dynamics of machines, in determining stresses and their fluctuations in machines and motors, and the applications of the principles of strength of materials, and of work-shop practice to the proper proportioning of the various parts.

The instruction in Steam Engineering treats of the fundamental laws of thermodynamics, and their application to steam and other heat engines, of the combustion of fuel, of steam generators and their construction, of the mechanism of the steam engine, and of the characteristic features of typical steam, and other heat engines. The instruction in designing the parts of the steam engine is given under the head of Machine Design.

The instruction in Hydraulic Motors and Machines treats of water-wheels and water pressure engines and machines.

The practice in Drawing is carried on in conjunction with the lectures and text-book study. It comprises tracing, copying, sketching from the structure, machine or motor, scale drawing from sketches, and the representation by curves of results of experiments or of mathematical investigations; to which is added the reproduction of drawings by the "Blue Process."

The Laboratory of Steam Engineering affords an opportunity of becoming acquainted, by experiment, with fundamental laws which underlie the practice of Steam Engineering. It also provides practice in adjusting, testing, and managing steam machinery and apparatus.

*The Instruction in Mining* is given to students of the third year by a course of eighty lectures on the general character of the various deposits of useful minerals, and on the theory and practice of mining operations, such as prospecting, boring, sinking of shafts, driving of levels, different methods of work-



ing, hoisting, pumping, ventilation, etc. These lectures are illustrated by drawings, and by a set of models from Freiberg, Saxony, which show in detail the methods of working underground by underhand and overhand stoping, the timbering and walling of shafts and levels, the arrangement of pumps, man engines, ladder ways, hoisting ways, the sinking of shafts etc.

In the fourth year ore-dressing and metallurgy are taken up in a course of sixty lectures. This is followed by a series of continuous practical exercises in the concentration and smelting of ores in the Mining and Metallurgical laboratories.

The professors in this department hope to give each student of Mining and Metallurgy at least one chance during his course of study to join a party organized for visiting some of the more interesting mining regions.

The valuable scientific library and the large geological collection of the late Prof. Henry D. Rogers, of the University of Glasgow, presented to the Institute by Mrs. Rogers, are accessible to the students in Geology and Mining. This collection is made up chiefly of fossils and rock specimens from American localities, and is especially rich in coal-plant fossils.

*The Mining and Metallurgical Laboratories.* These laboratories furnish to students in Mining and Metallurgy the means for studying experimentally the various processes of ore-dressing and smelting. Ores of different kinds may be here subjected, on a small scale, to the same modes of treatment as have been adopted at the best mining and metallurgical establishments.

The mining laboratory is supplied with two suites of milling apparatus:—

I. A five-stamp battery, a set of amalgamating plates, a mercury saver, buddles for concentrating tailings, an Attwood's amalgamator, and an amalgamating pan.

II. A Blake crusher, crushing rolls with automatic sizing screens, a Spitzkasten, four automatic machine jigs, an elevator, two end percussion tables (the Freiberg Stossherd), a

side percussion table (Rittinger's Stossherd), a settling tank, and a centrifugal pump, which throws the water from the settling tank back to the feed tank. The same water is thus used over and over again to avoid loss in slimes.

This laboratory also contains the following auxiliary apparatus:—a steam engine and boiler, a Whelpley & Storer pulverizer, an edge-stone mill, a Root blower, and a Sturtevant blower. The metallurgical laboratory contains a blast furnace, a reverberatory smelting furnace, a roasting furnace, a furnace for cupellation, furnaces for fusion, crucible and muffle assay furnaces, a blacksmith's forge, a melting kettle, and an eliquation furnace.

The experimental work of the laboratory is carried on by the students under the immediate supervision of an instructor. A sufficiently large quantity of ore is assigned to each student, who first examines it for its component minerals, sorts and samples it, and determines its character and value by analysis and assays, and makes such other preliminary examinations as serve to indicate the proper method of treatment. He then treats the given quantity, makes a careful examination of the products at each step of the process, ascertains the amount of power, water, chemicals, fuel, and labor expended, wherever practicable, and thus learns approximately the effectiveness and economy of the method adopted. Each student is assisted in working his ore by his classmates, who have an opportunity in this way to run the boiler, engine, machines, and furnaces.

The Institute is from time to time receiving ores of gold, silver, lead, copper, antimony, zinc, iron, etc. from various localities. These ores are worked, and reports sent to those who contribute them; and it is hoped that, by the co-operation of those who wish to have examinations made, the laboratory will continue to receive the necessary amount and variety of ores.

*Models, etc., relating to the Engineering courses.* The collections under this head consist of models in wood, in metal,

and in plaster, besides lithographs, photographs, and drawings collected in the United States and in Europe.

They illustrate the following subjects:—General descriptive Geometry, Linear Perspective, Shades, Shadows and Reflections, Masonry and Stone Cutting, Joints, Girders and Trusses for wood and Iron Structures, Furnaces and Boilers, Steam and Water Motors, Machines and their details.

*The Instruction in Architecture.* It is the object of this department to give to its students the instruction and discipline that cannot be obtained in architects' offices. The course is, however, practical as well as theoretical, and, besides the scientific study of construction and materials, it comprises the study of building processes, and of professional practice and procedure, as well as that of composition and design, and of the history of the art. It is so arranged as to meet the wants not only of young men who propose to pursue a comprehensive course of architectural study but of those who are looking only for such an elementary training as shall qualify them for positions as draughtsmen.

The more strictly professional work begins in the second year, the first half of which is given to the study of the Five Orders and their applications, and to Greek and Roman Architectural history. At the same time the students of the third and fourth years attend a series of lectures upon ornament and composition, or upon the theory of architecture. In the same way the study of specifications and working drawings is pursued by the two classes together, carpentry and its related subjects occupying one year, and masonry and stone-work the next. In the last half of the year the historical studies are continued, the second and third year classes attending the same exercises. The mediæval period, from the fall of the Roman Empire to the fall of Constantinople, and the modern period, including that of the Renaissance, are taken up in alternate years, so that each class is carried over the whole ground.

During the third and fourth years the students are con-

stantly practiced in original design. Each set of drawings is examined and criticised before both classes.

Special exercises are also had in shades, shadows, perspective, and the perspective of shadows, and in tracing and sketching, and drawing upon the blackboard, and in sketching, measuring, and drawing out buildings already erected.

Special students in Architecture are received into a special course, occupying two years, and embracing all the subjects mentioned in the three preceding paragraphs. Such students may also take any other studies which they are found prepared to pursue to advantage. If not proficient in free-hand drawing and in practical geometry they are required to make themselves so during the first half of the year, in addition to their other exercises. No other examinations are required for this special two years' course, but those who are intending to enter upon it are strongly recommended to prepare themselves for and to pass the regular examinations for entering the school (see pages 37 and 38), and they will not be permitted to take up any studies for which this preparation is required until they do so. The fee for this special course is two hundred dollars a year, the same as for the regular courses.

The Boston Society of Architects has established two prizes, of the value of fifty dollars each, for students in this department who at the end of the year exhibit the best year's work. The prizes are given in books. They were last year awarded to Mr. Thomas O'Grady, of Boston, and to Mr. William Zimmerman, of Thiensville, Wisconsin.

*The Architectural Museum.* Several thousand photographs, prints, drawings, and casts have been collected for this Department, by means of a special fund raised for the purpose.

To these collections the following additions have been made, mostly by gift:—

A considerable collection of photographs, lithographs, and drawings, presented to the Institute by French, English, and

American architects, taken from their own works, including sets of actual working drawings, with details and specifications.

A complete series of drawings, mostly presented by the late Ernst Benzon, Esq., of London, formerly a merchant of Boston, illustrating the course of Architectural instruction in the *Ecole des Beaux-Arts* in Paris:—*Esquisses-Esquisses, Projets Rendus, Projets d'ordre, Projets de Construction, Grand Prix de Rome, Envoi de Rome.*

The publications of the Royal Institute of British Architects, and of the *Société Central des Architectes*, in Paris, have been presented by the authorities of these institutions. The library contains nearly four hundred volumes.

A chief part of the collection of casts of architectural sculpture and detail belonging to the department has been deposited in the Museum of Fine Arts, along with the architectural collections belonging to the Museum. The students of the department have free access to them at all times, and as the Museum building is close at hand, no inconvenience results from the change. The space thus gained will be filled with specimens of metal-work, tile-work, glass-work, and wood-work, partly purchased, but mostly deposited with the department by the manufacturers, forming a museum of sanitary and building appliances.

*The Instruction in Natural History.* This is given with the aid of the collection and library of the Boston Society of Natural History, which, by an agreement between the Society and the Institute, are freely open to the students. These collections rank among the first in the country for extent and value, and in many departments are unsurpassed; the library is rich in works on Natural Science, many of them finely illustrated, and embraces the leading American and European journals and periodicals on Natural History. It is believed that the facilities thus afforded to the students of the Institute are ample for the most thorough instruction in Zoology, Palæontology, and other branches of Natural Science.

Botany is required in some of the courses as affording the proper and natural introduction to the study of Biology, Zoology, and Palæontology, and as being the science best calculated to train the mind for close observation, accurate description, and systematic classification. The instruction is given by lectures, recitations, and practical exercises in the examination of living plants. The numerous conservatories in Boston and vicinity furnish the means of studying hand specimens in many of the natural orders, and the wild flowers of early spring are usually obtained before the end of the school year.

The Biological laboratory has been furnished with a variety of microscopes and accessory apparatus, and affords uncommon facilities for both preparatory and advanced study. There is a choice collection of preparations, but attention is directed mainly to fresh tissues and live specimens. The working library of the professor in charge, which contains many valuable monographs as well as the more comprehensive works, is at the service of the students.

*The Instruction in Mineralogy.* Determinative Mineralogy is taught by the study of crystalline forms and the physical properties of minerals, and use of the blowpipe, and by the handling of specimens.

The collection of minerals in use for instruction is placed in the study room of the Mining department, and is thus ready for reference at any time.

*The Instruction in Zoology and Palæontology,* including the history of ancient animal life, and the study of the distinctive and characteristic fossils of the different formations, is given as a necessary foundation for the further study of Geology. The aim of the course is to give the student a practical acquaintance with the structure of the characteristic families and orders of living and extinct animals, and by a judicious selection of examples, to familiarize him to some extent with the genera which characterize various formations.

The handling and drawing of specimens by the students is an essential feature of the method of instruction. The lectures of the instructor are devoted largely to explanatory demonstrations of the specimens which the students are at the same time drawing.

*The Instruction in Physical Geography and Geology.* This course of instruction begins in the second term of the second year with forty-five lessons in Physical Geography, including Dynamical Geology. These lessons treat of the principal features of the earth's surface, their characteristics, classification, geographical relations, and of the changes which they have experienced within the historic period through the more important agencies, such as winds, frost, rain, rivers, glaciers, tides, volcanoes, earthquakes, plants and animals. This course is so arranged as to give the student a good general knowledge of Physical Geography, and at the same time it is an important preparation for the course in Historical Geology, given the next year.

Thirty lessons in Structural Geology, including a systematic course in Lithology, are next given during the first term of the third year. In this course oral instruction and laboratory work are combined, the aim being to place in the hands of each student a specimen of each type discussed. The principal structural features characterizing large masses of rocks, embracing stratification, joint structure, faults, folds, slaty cleavage, veins, dykes, etc., are taught in as practical a manner as circumstances will allow. This instruction is supplemented by frequent excursions to localities of geological interest in the vicinity of Boston. A course of fifteen lessons in Chemical Geology and the history of the crystalline formations is then given, which comprises the origin, alteration, and decay of rocks, the history of vein-stones and ore deposits, of rock salt and mineral waters, and of coal and petroleum, also a general sketch of the chemical history of the globe.

These are succeeded by forty-five lessons in Historical

Geology, given during the second term of the third year. In this course the physical history of the earth is taught as it is revealed by present changes, which have been studied in the course in Physical Geography, also by the structure and composition of the rocks, as taught in the course in Structural Geology, and by the fossilized remains of animals and plants, the nature of which has been learned in the course in Zoology and Palæontology. The geological positions and conditions of occurrence of ores and other economic products are taught in connection with the geological formations in which they are found, and the instruction is made as practical in character as its limits will admit. A collection of specimens and a series of pictorial representations are employed in the illustration of this branch. During the summer vacation excursions of several weeks are often made to regions where the fossiliferous formations are well developed.

The instruction in Political and Industrial Geography provides for an advanced course of geographical study in the fourth year. In it are taught the influences of geographical position, physical features, climates, etc. upon the resources of districts and countries, and upon the extent, character and prosperity of nations. Instruction in Meteorology is included in this course.

*The Instruction in Shop Work.* Shops or laboratories have been provided, and furnished with the more important hand and machine tools, so that the student may acquire a direct knowledge of the nature of metals, and woods, and some manual skill in the use of tools.

Practical instruction in the nature of the materials of construction and in the typical operations concerned in the arts, is considered a very valuable adjunct to the theoretical treatment of professional subjects. Students in the course of Mechanical Engineering are required to devote a considerable amount of time to work in Carpentry, Wood Turning, Pattern Making, Moulding and Casting, Forging, Chipping and Filing, and Planing and Turning the metals, the design



being to learn the principles, and not to manufacture articles for sale or use.

Students in other departments will be allowed to take shop work when the time can be arranged so as not to interfere with their regular studies.

*The Instruction in Military Science and Tactics.* In conformity with the requirements of the Act of Congress of July 2, 1862, and of the Act of the General Court of Massachusetts in furtherance thereof, the Institute provides instruction in military tactics. All students who take two or more first year studies are required to attend, three times a week, an exercise in tactics, unless specially excused by the Faculty. A written and drill examination are held at the end of the year. For the drill exercises they are required to provide themselves with uniforms which are made from measures and by contract, in order to secure uniformity of material and manufacture, as well as cheapness. The whole cost to each student does not exceed twenty dollars. The uniform must be worn at drill, and, being inconspicuous, may be worn at other times if the student chooses. Applications to be excused from drill may be granted by the Faculty when the student is an alien, a college graduate, or over twenty-one years of age, when he has a surgeon's certificate of disability, or is able to pass an examination satisfactory to the Department.

The large drill-hall includes a well-equipped gymnasium, used by all classes in the Institute.

*Excursions.* In aid of the practical studies of the school, and as a means of familiarizing students with the actual details of work they are required, in term time, to make visits of inspection to machine-shops, engines, mills, furnaces, and chemical works, and to important buildings and engineering constructions within convenient reach.

In the vacations more extended excursions are made for the survey of mines and geological features, and for the study of metallurgical works and noted specimens of engineering.

In past years parties of students have in this way visited mines, furnaces, and engineering works in Nova Scotia, Vermont, New York, Western Massachusetts, Pennsylvania, Colorado, Missouri, and the Lake Superior copper and iron regions.

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### *OCCASIONAL LECTURES.*

In addition to the instruction given by the permanent corps of teachers, gentlemen in active life who are eminent in their respective professions will, from time to time, be invited to give courses of lectures on subjects of practical importance.

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### *THE BOSTON PUBLIC LIBRARY.*

The professors and students of the Institute are allowed the full use of this library, which now contains over 360,000 volumes. Its reading room is supplied with the best scientific and technical, as well as literary publications, of different countries, and new books of value are promptly bought on proper application to the authorities of the Library. No college or school in the country has better facilities in these respects than those which the Trustees of the Boston Public Library have given to the officers and students of the Institute of Technology.

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### *SCHOLARSHIPS.*

A scholarship for regular students has been founded by the English High School Association, in memory of the late Thomas Sherwin, who, for more than thirty years, was the distinguished Master of the English High School of the City of Boston. Mr. Sherwin was also an active and influential

member of the Corporation of the Institute. The pupil, to receive the benefit of this scholarship, is to be a graduate of the English High School in the city of Boston.

Two scholarships were founded by the late James Savage, LL.D., the benefit of which is given to meritorious students on recommendation of the Faculty.

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### ADVANCED SCHOLARSHIPS.

Five advanced scholarships have been established, and will be awarded to such applicants as are recommended by the Faculty.

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### DEGREES AND DIPLOMAS.

The degrees corresponding to the regular courses are as follows:—

- |       |   |        |    |             |              |               |              |         |     |         |
|-------|---|--------|----|-------------|--------------|---------------|--------------|---------|-----|---------|
| I.    | A | DEGREE | IN | CIVIL       | AND          | TOPOGRAPHICAL | ENGINEERING. |         |     |         |
| II.   | " | "      | "  | MECHANICAL  | ENGINEERING. |               |              |         |     |         |
| III.  | " | "      | "  | MINING      | ENGINEERING, | OR            | IN           | GEOLOGY | AND | MINING. |
| IV.   | " | "      | "  | BUILDING    | AND          | ARCHITECTURE. |              |         |     |         |
| V.    | " | "      | "  | CHEMISTRY.  |              |               |              |         |     |         |
| VI.   | " | "      | "  | METALLURGY. |              |               |              |         |     |         |
| VII.  | " | "      | "  | NATURAL     | HISTORY.     |               |              |         |     |         |
| VIII. | " | "      | "  | PHYSICS.    |              |               |              |         |     |         |
| IX.   | " | "      | "  | THE         | ELECTIVE     | COURSE.       |              |         |     |         |
| X.    | " | "      | "  | SCIENCE     | AND          | LITERATURE.   |              |         |     |         |

The diploma is intended as an evidence of the student's diligence and attainments. In any of the first eight courses it is also an assurance to the public of his knowledge and skill in the particular department therein mentioned. In the last two, it shows that the student has faithfully and

successfully pursued the full course of studies, assigned or approved by the Faculty.

To be entitled to any one of these degrees, the student must have passed satisfactory examinations in all the prescribed studies and exercises; and, in addition, a final or degree examination, embracing all the subjects which particularly relate to his course. He must, moreover, prepare a dissertation on some subject included in his course of study; or an account of some research made by himself; or an original report upon some machine, work of engineering, industrial works, mine, or mineral survey; or an original architectural design accompanied by an explanatory memoir. This thesis or design must be approved by the Faculty.

Persons who have been admitted to departments of instruction in the school may, should they so desire, be examined for a degree, and, if found qualified to pass, under the prescribed conditions, they will be entitled to the appropriate diploma.

The examinations for Degrees are held in the month of May. The title of the degree in each of the courses is S.B., or Bachelor of Science, in \_\_\_\_\_.

The degree of S.D., or Doctor of Science, is awarded for proficiency in complete Advanced Courses of study.

Besides the diplomas of the Regular and Advanced Courses, certificates of attainment in special subjects are given to such students as, on examination, are found to have the required proficiency in them.

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## REGULATIONS OF THE SCHOOL.

*School-year.* The first term begins on the last Monday in September. There is a recess of one week after the semi-annual examinations, and the second term begins on the first Tuesday in February. On legal holidays, and on the Friday and Saturday following Thanksgiving day, the exercises of the school are suspended.

*Bond or Deposit.* Every student is required, on entering the school, either to give a bond for two hundred dollars to pay all charges accruing under the regulations of the school, or to deposit, if he prefer so to do, the sum of two hundred dollars with the Bursar, to be accounted for at the end of the school-year, or whenever the depositor leaves the school, in case he leaves it before the end of the year. This deposit must be renewed at the beginning of each year. The bond must be executed by two bondsmen, satisfactory to the Bursar, one of them being a citizen of Massachusetts; and it must be filed within ten days after the date at which the student joins the school.

*Fees.* The fee for regular students is \$200 per year, \$125 at the beginning, and \$75 at the middle (first Tuesday in February) of the school-year. For one-half, or any less fraction of the school-year, the fee is \$125. Payment is also required of the cost of apparatus broken or used up in the laboratories.

Special students pay, in general, the full fee; but when a few branches only are pursued, and the time required for instruction is limited, some deduction may be made. The fee for students in the advanced courses is the same as that for regular students.

*Attendance.* Regular students are expected to attend all the exercises of their several courses. Special students are expected to attend all the exercises in the subjects they have selected, unless excused by special vote of the Faculty. Students entering a lecture room, drawing room, or laboratory more than five minutes after the hour designated for the beginning of the exercise will be marked tardy. Students are, in general, expected to devote themselves to the work of the school between the hours of 9 A.M. and 4.30 P.M., except during the interval for dinner. There are no exercises on Saturday afternoon, and the rooms are closed.

*Discipline.* While within the limits of the Institute, students are expected to behave with decorum, to obey the regulations of the school, and to pay a due respect to its officers. Every student will be held responsible for the furniture which he uses, and the cost of repairing any damage thereto will be charged to him. In case of injury to the building, or to any of the furniture, apparatus, or other property of the Institute, the damage will be charged to the student or students known to be immediately concerned; but if the persons who caused the damage are unknown, the cost of repairing the same will be assessed equally upon all the students of the school. Conduct inconsistent with the general good order of the school, if repeated after admonition, will be followed by suspension or dismissal. It is the aim of the Faculty so to administer the discipline of the school as to maintain a high standard of integrity and a scrupulous regard for truth, and the attempt of any student to present as his own the work of another, or to pass any examination by improper means, is regarded as a most serious offense, and renders the offender liable to immediate expulsion.

*Residence and Expenses.* As the exercises of the school begin at nine o'clock in the morning, and end at half past four or five o'clock in the afternoon, students may conveniently live in any of the neighboring cities or towns on the lines of the various railroads, if they prefer to do so.

The cost of board and rooms in Boston, and the neighboring cities and towns, need not exceed from six to eight dollars a week. The cost of board at the Institute restaurant is three dollars and fifty cents per week, and conveniently located rooms may be found at a cost of two dollars and upwards additional per week.

The cost of books, drawing instruments, paper, etc., exclusive of chemical breakage, is from twenty-five to thirty-five dollars a year.

## SCHOOL OF MECHANIC ARTS.

A School of Mechanic Arts, in which special prominence is given to *manual* instruction, has been established for those who wish to enter upon industrial pursuits rather than to become scientific engineers.

This school is designed to afford such students as have completed the ordinary grammar school course an opportunity to continue the elementary scientific and literary studies, together with mechanical drawing, while receiving instruction in the use of the typical tools for working iron and wood.

The shop work is conducted upon a plan designed at the Imperial Technical School of Moscow, Russia, and carried out there with most satisfactory results. Its exact and systematic method affords the direct advantages of training the hand and eye for accurate and efficient service with the greatest economy of time; and the instruction in the use of tools and materials has also proved a valuable aid in intellectual development.

The shop courses of the school are as follows:—

*First year*: I, Carpentry and Joinery; II, Wood Turning; III, Pattern Making; IV, Foundry Work.

*Second year*: I, Iron Forging; II, Vise Work; III, Machine Tool Work.

The full course includes two years of theoretical and practical studies combined, and students, who successfully complete it, will receive a certificate. Students will be received for shorter times and for special portions of the course. When it is desired, such provisions will be made for advanced and specific shop work as are consistent with due attention to the regular classes.

Students in this school are recommended to attend the exercises in Military Drill, and hours will be so arranged as to allow them to do so without detriment to their studies.

Applicants for the regular course must be at least fifteen years of age, and must pass a satisfactory examination in Arithmetic, Geography, and English Composition.

The tuition is \$150 a year, with no extra charge for the use of tools or materials used in the regular exercises. Special students, taking the shop work only, will be charged \$70. The student is entitled to the products of his work. Students, while on the premises of the Institute, are expected to remain in the study room, except when at recitations or in the work shops. A monthly return of absences is made to the parent or guardian.

## FIRST YEAR.

## FIRST TERM.

Shop Work,—Carpentry.  
Algebra commenced.  
English Composition.  
Mechanical Drawing.

## SECOND TERM.

Shop Work,—Wood Turning, Pattern Making, Foundry Work.  
Plane Geometry.  
English Composition.  
Mechanical Drawing.

## SECOND YEAR.

## FIRST TERM.

Shop Work,—Forging.  
Algebra completed.  
Elementary Physics.  
English Composition.  
Mechanical Drawing.

## SECOND TERM.

Shop Work,—Vise Work, Machine Tool Work.  
Geometry.  
Physics.  
English Composition.  
Mechanical Drawing.

The beginning and ending of the school-year and the days of entrance examinations are the same as in the School of Industrial Science. See Calendar, page 2.

SCHOLARSHIPS OF THE MASS. CHARITABLE MECHANICS  
ASSOCIATION.

The two scholarships, founded by this Association, are awarded to sons of present or past members of the Association, on recommendation by the President and Secretary of the Association.

The scholarship entitles the student to free tuition in the School of Mechanic Arts.



## FREE COURSES OF INSTRUCTION.

The Trustee of the Lowell Institute has established, under the supervision of the Institute of Technology, courses of instruction, generally in the evening, open to students of either sex, free of charge.

These courses are more or less varied from year to year by the omission or interchange of particular subjects, but include in their entire scope instruction in mathematics, mechanics, physics, drawing, chemistry, geology, natural history, physiology, English, French, German, history, navigation and nautical astronomy, architecture, and engineering.

The subjects, and the extent of the several courses, will be made known in October of each year.

As it is the object of these courses to provide substantial teaching rather than merely popular illustration of the subjects treated, it is expected that all persons attending these courses will come with a serious purpose of improvement, and that they will cheerfully comply with such rules as may be prescribed in regard to attendance and to order in the class or lecture-room.

The conditions of attendance on these gratuitous courses are as follows:—

1. Candidates must have attained the age of eighteen years.
2. Their applications must be made in writing, addressed to the Secretary of the Faculty, specifying the course or courses they desire to attend; mentioning their present or prospective occupations; and, when the course is of a nature demanding preparation, stating the extent of their preliminary training.

The number of students in each class is necessarily limited.

The courses for 1880-1881 are on the following subjects:—

I. *Algebra*. Solution of numerical equations of higher degrees. A course of fifteen lectures by Prof. J. D. Runkle, on Mondays and Wednesdays, at 7.30 P.M., commencing November 15.

II. *English History and Literature.* A course of twelve lectures by Prof. William P. Atkinson, on Mondays and Thursdays, at 7.30 P.M., commencing January 3.

III. *Elementary German.* A course of fifteen lectures by Prof. C. P. Otis, on Tuesdays and Fridays, at 7.30 P.M., commencing February 1.

IV. *Advanced Studies in French.* A course of fifteen lectures by M. Jules Luquiens, on Mondays and Wednesdays, at 7.30 P.M., commencing January 31.

V. *Recent Applications of Electricity.* A course of fifteen lectures by Prof. Charles R. Cross, on Tuesdays, at 7.30 P.M., commencing December 7.

VI. *Strength of Materials.* A course of fifteen lectures by Prof. Gaetano Lanza, on Tuesdays and Fridays, at 7.30 P.M., commencing November 16.

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## LOWELL SCHOOL OF PRACTICAL DESIGN.

The Trustee of the Lowell Institute has made provision for a course of free instruction in Practical Design for Manufactures, open to a limited number of pupils of both sexes. Students are received at the beginning of the school-year in September, and are taught the art of making patterns for Prints, Gingham, Delaines, Silks, Laces, Paper Hangings, Carpets, Oil Cloths, etc.

The course embraces:—1, Technical manipulations; 2, Copying and variation of designs; 3, Original designs or composition of patterns; 4, The making of working drawings.

The hours of working are from 9 A.M. to 5 P.M., with an interval for dinner every day except Saturday, when the rooms are closed at 12 M. A monthly return of absences is made to the parent or guardian.

Instruction is given personally to each student over his work, with occasional general exercises. Students supply their own instruments and materials, the cost of which is about \$5 per year.

The class is under the personal direction of Mr. Charles Kastner, formerly Director of the Atelier Lebert in Paris, and for fifteen years designer at the Pacific Mills. Mr. Kastner is a nephew and pupil of M. Jean Baptiste Lebert, *Dessinateur*, of Mulhouse in Alsace.

The school is constantly provided with samples of all the novelties in textile fabrics from Paris, such as Brocade Silks, Ribbons, Alpacas, Armures, and fancy woolen goods. A weaving department is connected with the School, and provided with a Gingham Loom, a fancy Loom for Cotton and Worsted figured goods, a Loom for Silks, Ribbons, etc., illustrating the practical applications of designs for woven goods. During the year pupils will visit Print Works, Carpet Mills, etc.

Applicants for admission to the above course are required to bring specimens of their work, exhibiting an acquaintance with Free-hand Drawing, principally flowers from nature and ornamental scrolls, and some familiarity with the use of drawing instruments. Applicants may present themselves September 23d and 24th.

## GRADUATES AND THEIR OCCUPATIONS.

The Roman numerals in the column marked "Course" denote the Course in which the Graduate received the Degree of S.B.

**1868.**

NAME AND ADDRESS.	COURSE.	OCCUPATION.
ELLERY C. APPLETON, Allentown, Pa.	III.	Civil Engineer. Lehigh Coal and Navigation Co.
WHITNEY CONANT, Louisville, Ky.	III.	Not heard from.
* Frank R. FIRTH,	I.	Died June 9, 1872.
ELI FORBES, Clinton, Mass.	IX.	Chemist at the Lancaster Mills.
CHARLES C. GILMAN, Marshalltown, Marshall Co., Iowa.	III.	Chief Engineer Central Iowa Rail- road.
CHARLES E. GREENE, Ann Arbor, Mich.	I.	Prof. of Civil Engineering, Univer- sity of Michigan.
ALBERT F. HALL, Boston, Mass.	II.	Draughtsman in the employ of the George F. Blake Manuf. Co.
WILLIAM E. HOYT, 16 Metropolitan B'k, Chicago, Ill.	I.	Locating Engineer of Lake Erie and Western R. R.
ROBERT H. RICHARDS, Boston, Mass.	III.	Professor of Mining Engineering, Mass. Institute of Technology.
WALTER H. SEARS, Stillwater, Minn.	I.	Chief Engineer Stillwater Water Works.
CHARLES A. SMITH, St. Louis, Mo.	I.	Prof. of Civil and Mechanical Engin- eering at Washington University.
JOSEPH STONE, Manchester, N. H.	I.	Agent of the Manchester Mills.
BRYANT P. TILDEN, 77 Charles St., Boston, Mass.	III.	Superintendent of the Sullivan Sil- ver Mining Co.
JAMES P. TOLMAN, 66 Chauncy St., Boston, Mass.	III.	Superintendent Silver Lake Co.
WILLIAM H. BAKER, Las Vegas, New Mexico.	I.	Chief Engineer's Office, A. S. and S. F. R. R.

**1869.**

NAME AND ADDRESS.	COURSE.	OCCUPATION.
HOWARD A. CARSON, 425 Shawmut Ave., Boston, Mass.	I.	Civil Engineer.
J. RAYNER EDMANDS, Cambridge, Mass.	II.	Employed at the Observatory of Harvard University.
WM. RIPLEY NICHOLS, Boston, Mass.	V.	Professor of General Chemistry, Mass. Institute of Technology.
CHANNING WHITAKER, Boston, Mass.	II.	Professor of Mechanical Engineer- ing, Mass. Institute of Technology.

**1870.**

* EDWARD K. CLARK,	II.	Died Sept. 10, 1878.
CHARLES R. CROSS, Boston, Mass.	IX.	Professor of Physics, Mass. Insti- tute of Technology.
RUSSELL H. CURTIS, Rock Island, Ill.	I.	Lawyer.
CHARLES W. HINMAN, 32 Hawley St., Boston, Mass.	III.	State Inspector of Gas.
SAMPSON D. MASON, St. Paul, Minn.	I.	Treasurer and Chief Engineer, De- troit, Eel River, and Illinois R. R.
N. FREDERICK MERRILL, Salem, Mass.	V.	Chemist.
THEODORE F. TILLINGHAST, New Bedford, Mass.	I.	Unemployed.
EDMUND K. TURNER, Boston, Mass.	I.	Assistant Superintendent and Chief Engineer, Fitchburg Railroad.
DANIEL W. WILLARD, 39 E. 18th St., N. Y. City.	II.	Architect.
LAWRENCE F. J. WRINKLE, Virginia City, Nevada.	III.	Mining Engineer.

**1871.**

FOSTER E. L. BEAL, Ames, Iowa.	I.	Professor of Zoology and Compara- tive Anatomy, Agr. College.
ADDISON CONNOR, Holyoke, Mass.	I.	Civil Engineer, with Holyoke Water Power Co.
* HENRY M. CUTLER,	I.	Died May 16, 1877.
ELMER FAUNCE, 4 Pemberton Sq., Boston, Mass.	III.	Chemist.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
EDW. H. FOOTE, 10 No. Market St., Boston, Mass.	I.	In Business.
FRANK L. FULLER, 7 Exchange Pl., Boston, Mass.	I.	Civil Engineer.
HENRY M. HOWE, Capelton, P. Q.	III.	Mining Engineer of Oxford Nickel and Copper Co.
ALBERT H. HOWLAND, 12 West St., Boston, Mass.	I.	Civil Engineer.
G. RUSSELL LINCOLN, Steelton, Dauphin Co., Pa.	III.	Chemist at the Pennsylvania Steel works.
WILLIAM A. PIKE, Minneapolis, Minn.	I.	Professor of Engineering, Univer- sity of Minnesota.
GEORGE H. PRATT, So. Boston, Mass.	V.	Chemist at the Bayside Alkali works.
EDWARD W. ROLLINS, Denver, Colorado.	III.	Broker.
WALTER W. SMITH, Dayton, Ohio.	II.	Builder of Steam Pumps and Hy- draulic Machinery (Smith, Vaile & Co.)
CHARLES F. STONE, Waltham, Mass.	III.	Lawyer.
* ALMARIN TROWBRIDGE, JR.	II.	Died Dec. 5, 1878.
ISAIAH S. P. WEEKS, Walla Walla, Washington Ter.	I.	Civil Engineer on Northern Pacific R. R.
RANDALL WHITTIER, 153 Tremont St., Boston, Mass.	V.	In Business.

**1872.**

C. FRANK ALLEN, Las Vegas, New Mexico.	I.	In charge of Engineer's office, Atchi- son, Topeka and Santa Fé R. R.
B. E. BREWSTER, Cheyenne, Wyoming Ter.	III.	Cattle Breeding.
WILLIAM B. DODGE, Beverly, Mass.	I.	Engineer Corps, Pittsburgh, Cincin- nati and St. Louis R. R., Steu- benville, O.
FREDERIC A. EMMERTON, Joliet, Ill.	V.	Chemist at the Joliet Iron and Steel Co.'s Works.
JAMES A. HERRICK, Pittsburgh, Pa.	V.	General Supt. Spring, Steel, and Iron Co.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
JAMES M. HODGE, Plymouth, Mass.	III.	Agent of Baker White Brass Co.
BRADFORD H. LOCKE, Central City, Colo.	III.	Mining Engineer.
CHARLES S. MINOT, Harvard Medical School, Boston, Mass.	V.	Lecturer on Embryology, Harvard Medical School, and Instructor in Oral Pathology, Harvard Dental School.
WALTER SHEPARD, Dorchester, Mass.	I.	Assistant Engineer, Boston and Albany R. R.
RICHARD H. SOULE, Baltimore, Md.	II.	Supt. of the Motive Power, North Central Railway, B. & P. R. R.
CLARENCE S. WARD, 62 Sears' Building, Boston, Mass.	III.	Lawyer.

**1873.**

AMORY AUSTIN, 55 Kilby St., Boston, Mass.	V.	Chemist.
GEORGE W. BLODGETT, 52 Kilby St., Boston.	I.	Manufacturing Electrician and Asst. Engineer, B. & A. R. R., in charge of Electric Signals.
WILLIAM E. BROTHERTON, Cincinnati, Ohio.	V.	Collection Clerk of the National Lafayette and Bank of Commerce.
* SAMUEL A. FABENS, JR.,	I.	Died March 14, 1875.
SAMUEL M. FELTON, JR., Pittsburgh, Pa.	I.	General Superintendent of Pitts- burgh, Cincinnati & St. Louis R.R.
FREDERICK L. FISHER, Medway, Mass.	I.	Insurance Agent and Broker, 35 Kilby St., Boston; and Medway, Mass.
FREDERICK GUILD, JR., 13 Charles St., Boston, Mass.	I.	Foreign Shipping and Commission Merchant.
WILLIAM D. HARRIS, Lucerne, P. Q., Canada.	I.	Proprietor and Superintendent of the Sigma (phosphate) Mine.
CLARENCE L. HOWES, Hadover, Mass.	I.	Physician.
WILLIAM P. JEWETT, Minneapolis, Minn.	I.	Unemployed on account of ill health.
WILLIAM A. KIMBALL, 91 Franklin St., New York City.	II.	In Business.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
* WILLIAM C. MAY,	V.	Died March 11, 1878.
FRANK B. MORSE, Memphis, Cal.	I.	Assayer, Robinson's Ferry, Memphis, Calaveras County, Cal.
HENRY A. PHILLIPS, Kendallville, Ind.	IV.	Trackmaster on Lake Shore and Mich. Southern R. R.
GEORGE PHILLIPPS, Marshfield, Mass.	III.	Superintendent of an Antimony Mine.
ELLEN H. S. RICHARDS, Boston, Mass.	V.	Inst'r in Chemistry in the Woman's Laboratory of the Mass. Institute of Technology.
HENRY L. RIPLEY, Boston, Mass.	II.	2d Lieut. U.S. Army, 24th Infantry.
ROBERT A. SHAILER, Wilmington, Del.	I.	Asst. Supt. in charge of Bridge Dept., Edge Moor Iron Co., Wilmington, Del.
C. EDWARD STAFFORD, Steelton, Dauphin Co., Pa.	III.	Supt. Open Hearth Furnace, Steel Department, Penn. Steel Works.
SAMUEL E. TINKHAM, Boston, Mass.	I.	Assistant in City Engineer's Department.
FRANK W. VERY, Allegheny, Pa.	V.	Assistant Astronomer, Allegheny Observatory.
WEBSTER WELLS, Boston, Mass.	I.	Travelling.
RANDALL WHITTIER,	I.	(See record of Class of 1871.)
FRANCIS H. WILLIAMS, 100 Boylston St., Boston, Mass.	V.	Physician.
LOUIS F. WOOD, 56 Broad St., Boston, Mass.	V.	Chemical and Color Manufacturer.

**1874.**

HERBERT BARROWS, Reading, Mass.	I.	Not heard from.
GEORGE H. BARRUS, Reading, Mass.	II.	Expert Steam Engineer, 87 Milk St., Boston, Mass.
WILLIAM T. BLUNT, 2828 Washington Ave., St. Louis, Mo.	I.	Assistant Engineer U. S. Mississippi Commission.
GEORGE E. DOANE, Middleboro, Mass.	I.	Clerk.



NAME AND ADDRESS.	COURSE.	OCCUPATION.
WILLIAM B. DOWSE, 35 Bedford St., Boston, Mass.	IV.	Of the firm of Chauncey Rubber Co. Mfrs. of Rubber Clothing.
JOSEPH S. EMERSON, Honolulu, Hawaiian Islands.	I.	Civil Engineer.
ELIOT HOLBROOK, Providence, R. I.	I.	Civil Engineer, 283 Westminster St.
AECHIRAU HONGMA, Tokio, Japan.	I.	Civil Engineer.
CHARLES P. HOWARD, Hartford, Conn.	I.	With J. L. Howard & Co., dealers in Railway and Car Builders' Supplies.
FRANK H. JACKSON, Maple Hill, Kansas.	III.	Stock raising.
* WILLIS H. MYRICK,	II.	Died Oct. 17, 1875.
HERBERT B. PERKINS, Appleton, Wis.	I.	Professor of Mathematics and As- tronomy in Lawrence University.
FRANK H. POND, 214 North 8th St., St. Louis, Mo.	II.	Mechanical Engineer.
EDWARD S. SHAW, 10 Kirkland Pl., Cambridge, Mass.	I.	Civil Engineer, employed in design- ing Bridges and Roofs.
FRANCIS H. SILSBEE, Victory Mills, Saratoga Co., N.Y.	II.	Superintendent of the Saratoga Vic- tory Mills.
* ARTHUR W. SWEETSER,		Died Oct. 17, 1875.
ROBERT C. WARE, Beach Bluff, Mass.	IX.	Unemployed
STEPHEN H. WILDER, Cincinnati, Ohio.	IX.	Not heard from.

**1875.**

SAMUEL E. ALLEN, 74 Worth St., New York, N.Y.	I.	Agent for the Nashawannuck Manu- facturing Co.
JAMES L. ARNOTT, 91 Franklin St., New York, N.Y.	IX.	Not heard from.
AMOS J. BOYDEN, 218½ Walnut St., Philadel- phia, Pa.	IV.	In charge of Philadelphia office of Messrs. Cabot and Chandler.
MOSES D. BURNETT, Ocala, Marion Co., Fla.	III.	Of the firm of Robinson, Burnett & Co., Milling business.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
HENRY K. BURRISON, Boston, Mass.	I.	Instructor in Drawing in the Mass. Institute of Technology.
CHRISTOPHER A. CHURCH, Lewisburg, Greenbriar Co., W. Va.	I.	Sheep farming.
FRANK S. DODGE, Makawao, Maui, Hawaiian Is.	I.	Assistant Engineer Hawaiian Engineer corps.
EDGAR S. DORR, Mt. Auburn, Mass.	I.	Employed in the Sewer Dept., Boston, Mass.
WILLIAM C. EDES, San Francisco, Cal.	I.	Employed on the Southern Pacific Railroad.
CHAS. W. GOODALE, Charleston, Pima Co., Arizona.	III.	Supt. of Boston and Arizona Smelting and Reduction Works.
EDWARD A. W. HAMMATT, Newton Centre, Mass.	I.	Civil Engineer.
EDW. A. HANDY, Cañon City, Col.	I.	Civil Engineer.
* JAMES H. HEAD,	II.	Died August 18, 1875.
THOMAS HIBBARD, Boston, Mass.	II.	Draughtsman, Boston Sugar Refining Co., East Boston.
* WILLIAM F. HUNTINGTON,	I.	Died August 7, 1877.
LEONARD P. KINNICUTT, Cambridge, Mass.	V.	Assistant in Chemistry at Harvard University.
JAMES A. KNAPP, Abington, Mass.	II.	Of the firm of J. B. Knapp & Son, Manufacturers of Boots and Shoes.
WILFRED LEWIS, Philadelphia, Pa.	II.	Mechanical Engineer, with Wm. Sellers & Co., Philadelphia, Pa.
SAMUEL J. MIXTER, Vienna, Austria.	VIII.	Physician.
BENJAMIN A. OXNARD, Brooklyn, N. Y.	III.	Superintendent of Fulton Sugar Refinery.
THOMAS D. PLIMPTON, Hyde Park, Mass.	II.	Employed in the Manufacture of Woolen Goods.
WILLIAM A. PRENTISS, Holyoke, Mass.	IX.	Of the firm of Geo. W. Prentiss & Co., Manufacturers of Iron Wire.
FRANCIS T. SARGENT, New York, N. Y.	II.	Proprietor of the Sand-blast process.
WELLAND F. SARGENT, Pullman, Ill.	I.	In charge of Civil Engineering Dept. Pullman Palace Car Co., Kensington, Ill.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
WILLIAM H. SHOCKLEY, Candalaria, Esmeralda Co., Nev.	III.	Northern Belle Mining Co.
JAMES B. STANWOOD, Mt. Auburn, Cincinnati, Ohio.	II.	Head Draughtsman and Engineer with Lane & Bodley.
H. L. J. WARREN, Crescent City, Del Norte Co., Cal.	III.	Mining Engineer, Big Flat Gravel Mining Co.
WILLIAM R. WEBSTER, Philadelphia, Pa.	III.	Not heard from.

## 1876.

CHARLES F. ALLEN, Las Vegas, New Mexico.	III.	Principal office engineer of Atchison, Topeka & Santa Fe R. R.
THOMAS ASPINWALL, Brookline, Mass.	I.	Civil Engineer, 7 Exchange Place, Boston.
WILLIAM P. ATWOOD, Lowell, Mass.	V.	Chemist at the Hamilton Print Works.
THOMAS W. BALDWIN, Bangor, Maine.	I.	City Engineer and Superintendent of Sewers.
WALTER B. BARROWS, Uruguay, Argentine Republic.	VII.	Professor of Chemistry and Physics.
AARON D. BLODGETT, 52 Kilby St., Boston, Mass.	II.	Electrician.
JOSHUA B. F. BREED, 482 Fourth St., Louisville, Ky.	I.	Not heard from.
HARRY T. BUTTOLPH, Buffalo, N. Y.	I.	Draughtsman, City Engineer's office.
WILLIAM O. CROSBY, Boston, Mass.	VII.	Assistant in Geology and Palaeontology in Mass. Inst. of Tech.
FREDERICK K. COPELAND, Winchester, Mass.	I.	Unemployed on account of ill health.
WILLIS E. DAVIS, San Francisco, Cal.	IX.	Employed by Davis & Cowell, Manufacturers of Santa Cruz Lime.
* CLARENCE L. DENNETT,	II.	Died June 5, 1878.
CHARLES R. FLETCHER, Boston, Mass.	V.	Lecturer on Chemistry in Boston University, & Mass. State Assayer.
JOHN R. FREEMAN, Lawrence, Mass.	I.	Principal Assistant Engineer Essex Water Power Co.
FRANCIS E. GALLOUPE, Providence, R. I.	II.	R. I. Locomotive works.
* ROBERT H. GOULD,	VI.	Died Nov. 19, 1878.
JOHN B. HENCK, JR., 109 Court St., Boston, Mass.	VIII.	In the experimental dept., American Bell Telephone Co.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
FRANK W. HODGDON, Arlington, Mass.	I.	Asst. Engineer, with the Harbor and Land Commissioners of Mass.
SUMNER HOLLINGSWORTH, So. Braintree, Mass.	II.	Superintendent of Paper Mills.
SILAS W. HOLMAN, Boston, Mass.	VIII.	Assistant in Physics in the Mass. Institute of Technology.
ALFRED E. HUNT, Nashua, N. H.	III.	Chemist and Supt. of Steel Dept. of Nashua Iron and Steel Co.
WILLIAM W. JACQUES, 109 Court St., Boston, Mass.	VIII.	Electrician of the American Bell Telephone Co.
SAMUEL JAMES, JR., Silver City, New Mexico.	III.	Assayer.
ALFRED C. KILHAM, St. Louis, Mo.	II.	Employed in the repair shops of the Missouri P. R. R., St. Louis, Mo.
THEODORE J. LEWIS, 2224 Greene St., Phil., Pa.	II.	In the Test Dept., Penn. Railroad Company, Pittsburgh, Pa.
ALBERT H. LOW, Box 2524, Leadville, Col.	V.	Assayer.
CHARLES T. MAIN, Manchester, N. H.	II.	Engineer at the Manchester Mills.
ARTHUR L. MILLS, Everett, Mass.	I.	Civil Engineer.
WILLIAM E. NICKERSON, Somerville, Mass.	V.	Chemist.
D. W. PHIPPS, 31 Leverett St., Boston, Mass.	Phil.	Student in Boston University Law School.
CHARLES F. PRICHARD, Dedham, Mass.	II.	Superintendent of the Dedham and Hyde Park Gas Works.
HENRY RAEDER, JR., Aurora, Ill.	I.	Asst. Engineer of C. B. & Q. R. R.
CHARLES L. RICH, Stowe, Vt.	I.	Principal of the Stowe High School.
* T. W. ROBINSON,	III.	Died Nov. 3, 1880.
CHARLES A. SAWYER, 1640 Indiana Ave., Chicago, Ill.	IX.	Attorney at Law. 24 Portland Block, Chicago, Ill.
THEODORE E. SCHWARZ, Georgetown, Col.	III.	Mining Engineer and Expert.
JULIUS H. SUSMANN, 42 Upton St., Boston, Mass.	III.	In business.
WALTER D. TOWNSEND, Yokohama, Japan.	III.	With the American Clock and Brass Co.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
CHARLES N. WAITE, Manchester, N. H.	V.	Chemist at the Manchester Mills.
HENRY M. WAITT, Mass. Inst. Technology, Boston.	I.	Assistant in Civil Engineering.
ROBERT C. WARE.	Phil.	(See record of class of 1874.)
HENRY B. WOOD, Woburn, Mass.	I.	In business.
<b>1877.</b>		
JOHN ALDEN, Pacific Mills, Lawrence, Mass.	V.	Chemist at the Pacific Mills.
GEORGE BARTOL, Cleveland, Ohio.	III.	Chemist at the Otis Iron and Steel Works.
CHARLES S. BACHELDER, Napa City, Cal.	V.	Bookkeeper in the Pacific Bank.
J. WILLIAMS BEAL, Hanover P. O., So. Scituate, Mass.	IV.	Architectural Draughtsman.
WILLIAM H. BEECHING, Boston, Mass.	II.	Asst. in Mechanical Engineering in the Mass. Inst. of Technology.
HENRY H. CARTER, 55 St. James St., Roxbury, Mass.	I.	Asst. Engineer; Improved Sewerage of Boston.
GEORGE W. CAPEN, Canton, Mass.	IV.	Architectural Draughtsman, with J. P. Rinn, Architect, Boston.
WILLIAM E. CHAMBERLIN, 7 Rue de Tournai, Paris, France.	IV.	Student in the Ecole des Beaux-Arts, Paris.
* GEORGE R. CHAPMAN.	II.	Died Jan. 21, 1879.
LINUS FAUNCE, Steubenville, Ohio.	II.	With the P. C. and St. L. Railway Co.
CHARLES H. FISHER, 21 Chauncy St., Boston, Mass.	II.	Foreman in Knitting Shop.
WILLIAM C. FLINT, 53 Lafayette St., Salem, Mass.	III.	In Business.
PIERCE P. FURBER, 21 Courtland St., New York, N. Y.	IV.	Architectural Draughtsman, with Peabody & Stearns, Architects.
MARTIN GAY, West New Brigh'n, Staten Isl., N. Y.	I.	Leveller in Department of Public Works of New York City.
JOSEPH P. GRAY, 237 Central St., Lowell, Mass.	I.	Not heard from.
EDMUND GROVER, San Marcial, New Mexico.	I.	Asst. to the Engineer of Bridges and Buildings, Atchison, Topeka and Santa Fé R. R.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
RICHARD A. HALE, Lawrence, Mass.	I.	Assistant Engineer with the Essex Water Power Co.
JOHN E. HARDMAN, Leadville, Col.	III.	Engaged in Smelting.
HENRY D. HIBBARD, Nashua, N. H.	III.	Chemist to the Nashua Iron and Steel Co.
WALTER JENNEY, 55 G St., So. Boston, Mass.	III.	Chemist at Stephen Jenney & Co.'s Coal Oil Works.
JOSEPH KIRK, Manchester, N. H.	II.	Draughtsman, with the Amoskeag Manufacturing Co.
GEORGE W. KITTREDGE, Steuenville, Ohio.	I.	Engineer Corps, P. C. and St. L. R. R. Co.
CHARLES F. LAWTON, Tucson, Arizona.	I.	Transitman on the Atchison, Topeka and Santa Fé R. R.
BENJAMIN C. MUDGE, 95 Summer St., Lawrence, Mass.	I.	Asst. Supt. Woolen Dept., Washington Mills, Lawrence, Mass.
CECIL R. PEABODY, Sapporo, Japan.	II.	Prof. of Engineering in the Agricultural College at Sapporo, Japan.
ARTHUR L. PLIMPTON, 7 Hawthorn St., Roxbury, Mass.	I.	Asst. on Engineering Corps of Improved Sewerage of Boston.
HARRY C. SOUTHWORTH, Hancock, Houghton Co., Mich.	III.	Mining Engineer.
* CHARLES E. STEWART,	I.	Died Oct. 7, 1877.
THOMAS F. STIMPSON, Providence, R. I.	III.	Chemist, with the Silver Spring Bleaching and Dyeing Co.
GEORGE F. SWAIN, 150 Point St., Providence, R. I.	I.	Employed in the U. S. Census Bureau.
FRANK E. WIGGIN, 11 Wyman St., Roxbury, Mass.	I.	Unemployed.
FREDERICK W. WOOD, Steelton, Dauphin Co., Pa.	III.	Asst. Supt. Open-hearth Furnace Pennsylvania Steel Co.

**1878.**

WILLIAM B. ALLBRIGHT, Chicago, Ill.	V.	Chemist, with N. K. Fairbank, 18th and Blackwell Sts., Chicago.
CHARLES M. BAKER, 117 Commonw'th Av., Boston, Mass.	IV.	With Baker & Morrill, 40 Equitable Building, Boston.
TAKUMA DAN, Osaka, Japan.	III.	Professor of Chemistry, Osaka University.
CHARLES S. EATON, 115 Central St., Lowell, Mass.	IV.	Architect.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
ALFRED S. HIGGINS, 130 Court St., Boston, Mass.	IV.	With R. R. HIGGINS & Co.
JULIAN A. KEBLER, Burlington, Iowa.	I.	On the Engineer Corps of the Chicago, Burlington & Quincy R. R.
FRANK H. MORGAN, Springfield, Mass.	V.	Chemist, with Newell Bros. Manufacturing Co.
EVERELL J. NICHOLS, Madison, Wis.	I.	Instructor in Civil Engineering, Wisconsin University.
FREDERICK H. PRENTISS, 16 Bulfinch St., Boston.	II.	Asst. in the Mining and Metallurgical Laboratory, Mass. Institute of Technology.
JAMES RITCHIE, Zanesville, Ohio.	I.	Employed by H. F. Walling, Surveyor, in making Maps.
JAMES W. ROLLINS, JR., West Roxbury, Mass.	I.	Employed on the Massachusetts Central Railroad, Waltham.
CHARLES D. SAWIN, 368 Main St., Charlestown, Mass.	IX.	Student at the Harvard Medical School, Boston.
PETER SCHWAMB, Arlington, Mass.	II.	Draughtsman, Hinckley Locomotive Co., 439 Albany St., Boston, Mass.
FREDERIC P. SPALDING, 471 Middlesex St., Lowell, Mass.	I.	Employed in the City Engineer's office, Boston, Mass.
ISAAC M. STORY, Engineer's office, P.W.&B.R.R.	I.	Assistant Engineer, P.W. & B. R.R. Philadelphia, Penn.
EDMUND TANAY, Washington, D. C.	I.	With the U. S. Coast and Geodetic Survey.
LINWOOD O. TOWNE, Philadelphia, Penn.	III.	Assistant in Mineralogy and Assaying, University of Penn.
EMILE F. WILLIAMS, 230 Washington St., Boston, Mass.	I.	In Business.
JAMES G. WOOLWORTH, Providence, R. I.	V.	Chemist in charge of Dyeing, with Silver Spring Bleaching Co.

**1879.**

WALTER S. ALLEN, 42 Nürnberger Strasse, Leipzig, Ger.	V.	Student of Chemistry.
SAMUEL T. BRALEY, Newtonville, Mass.	II.	Employed in the Machine Shop of the Silver Lake Manuf. Co.
JOHN W. CABOT, Johnstown, Penn.	III.	Open-hearth dept. Cambria Iron Works, Johnstown, Pa.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
HARRY H. CAMPBELL, Steelton, Dauphin Co., Penn.	III.	Bessemer dept., Penn. Steel Co.
FRED. S. COFFIN, 22 Merchants' Ex., Boston, Mass.	III.	Bookkeeper for G. R. Coffin, special insp. & agt. West. grain shippers.
W. OTIS DUNBAR, Altoona, Penn.	II.	Employed in Penn. R. R. Locomotive shops.
GEO. W. FABENS, Burlington, Iowa.	I.	Employed on the Chicago, Burlington and Quincy R. R.
CHARLES S. GOODING, Charleston, S. C.	II.	Teacher of mechanics, drawing, etc., School of the Holy Communion.
ERNEST C. HARTWELL, 1131 Tremont St., Boston, Mass.	IV.	Draughtsman, E. & G. G. Hook & Hastings, Church-organ builders.
RAPHAEL M. HOSEA, Burlington, Iowa.	I.	On Engineer Corps of the Chicago, Burlington and Quincy R. R.
HORACE J. HOWE, 187 West St., New York, N. Y.	I.	In the Eng. Dept. New York, Lake Erie and Western R. R. Co.
FRED. B. KNAPP, Chicago, Ill.	I.	Engineer corps, track dept. Iowa div. Chic., Burlington & Quincy R.R.
FRED. H. LANE, Chambersburg, Penn.	II.	Assistant supt. of the Chambersburg Woolen Mills.
FRED. R. LORING, Boston, Mass.	VII.	Assistant in Chemistry, Mass. Institute of Technology.
WM. W. MACFARLANE, Montreal, Canada.	V.	Chemist to the Canada Sugar Refining Company.
ARTHUR H. METCALF, Pawtucket, R. I.	II.	Mechanical Engineer.
EDWIN C. MILLER, 611 Washington St., Boston.	II.	With Henry F. Miller, Piano Manufacturer.
EDWARD H. OWEN, JR., Willimantic, Conn.	II.	Draughtsman for the Willimantic Linen Co.
WILLIAM H. PICKERING, Boston, Mass.	VIII.	Assistant in Physics, Mass. Institute of Technology.
GEORGE F. RIGGS, Nemaha City, Neb.	I.	Asst. Engineer, Burlington and Missouri River R. R.
FRANK G. STANTIAL, Montreal, Canada.	V.	Chemist with the Canada Sugar Refining Co.
WM. S. STEARNS, Cincinnati, Ohio.	I.	Employed by the Keystone Bridge Co.
ARTHUR M. WAITT, Aurora, Ill.	II.	Employed in Mechanical Eng.'s office, Chic., Bur. & Quincy R.R.



**1880.**

NAME AND ADDRESS.	COURSE.	OCCUPATION.
GEORGE H. BARTON, N. Sudbury, Mass.	III.	Assistant in Drawing, Mass. Institute of Technology.
CHAS. H. BROWN, Columbus, Ohio.	I.	Employed by the P. C. and St. L. R. R. Co.
EDWIN E. CHASE, Central City, Col.	I.	Asst. to Bradford H. Locke, Mining Eng. & U.S. deputy mineral sur.
FREDERICK W. CLARK, Silver City, Idaho.	III.	Superintendent Tremont Mining Co.
GEORGE W. HAMILTON, Jacksonville, Texas.	I.	Engineering Dept. Texas Trunk R. R.
LORING R. MILLEN, Silver Cliff, Col.	III.	Assayer.
WILLIAM T. MILLER, 611 Washington St., Boston, Mass.	X.	With Henry F. Miller, Piano Manufacturer.
* NATHANIEL C. SMALL,	V.	Died July 14, 1880.

Alumni will confer a favor by informing the Secretary of the Faculty of any change of address or occupation.

Other persons who have been connected with the Institute for one year or more will also confer a favor by informing the Secretary of the Faculty of their address and occupation.

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## LOWELL SCHOOL OF PRACTICAL DESIGN.

### LIST OF PERSONS WHO HAVE RECEIVED A CERTIFICATE, AND THEIR PRESENT SITUATIONS.

**1876.**

Everett Anthes, . . . .	Manchester Print Co., Boston.
Annie W. Barnard, . . . .	Not heard from.
H. J. Green, . . . . .	Teacher of Drawing, South Boston.
Howard Hinckley, . . . .	Merrimac Print Co., Boston.
James B. Folsom, . . . .	Hartford Carpet Co., Thompsonville, Ct.
Mary I. Jefferson, . . . .	Manchester Print Co., Boston.
Alexander Johnston, . . . .	Pacific Mills, Lawrence.
Elizabeth Mendum, . . . .	Manchester Print Co., Boston.
Henry Morse, . . . . .	Carpet Mills, Maine.

## 1876.

Charles H. Cowdrey, . . . .	Oriental Print Works, Boston.
Edgar Eames, . . . . .	Merrimac Print Co., Boston.
Silas R. Eaton, . . . . .	Merrimac Print Co., Boston.
Carroll S. Faunce, . . . .	Hamilton Woolen Co., New York.
Ernest R. Pierce, . . . . .	Pacific Mills, Lawrence.
Minnie C. Rieker, . . . . .	Hamilton Print Co., Boston.

## 1877.

Mary E. Frederick, . . . . .	Oil Cloth Designer, Medford.
Caroline S. Greene, . . . . .	Crayon Artist, Boston.
Samuel Hudson, . . . . .	Pacific Mills, Lawrence.
Henry P. Mabile, . . . . .	American Print Co., New York.
Salmon C. Pennock, . . . .	Artist, Flower Painting, Boston.
* William Schroeder, . . . .	Died June, 1880.
Kate T. Simonds, . . . . .	David Brown & Co., Philadelphia.
Annie D. Stimers, . . . . .	Sprague Print Co., New York.
John H. Tarbell, . . . . .	Donnell Mfg. Co., New York.

## 1878.

Frank Hyde, . . . . .	Merrimac Print Co., Boston.
Harriet A. Parker, . . . . .	Roxbury Carpet Co., Roxbury.
Caroline L. Stafford, . . . .	Oriental Print Works, Boston.
Harry M. Symmes, . . . . .	Merrimac Print Co., Boston.
Fannie W. Tewksbury, . . . .	Artist, Flower Painting, Newtonville.
Charles H. Underwood, . . . .	Merrimac Print Co., Boston.
Charles A. Washburne, . . . .	Amsterdam Carpet Co., Amsterdam, N.Y.
Reuben Winslow, . . . . .	Merrimac Print Co., Boston.

## 1879.

George Albro, . . . . .	Pacific Mills, New York, N. Y.
Elizabeth C. Bean, . . . . .	Trenton China Works, Trenton, N. J.
Eva M. Close, . . . . .	Forbes Lithograph Co., Boston.
Charles C. Cox, . . . . .	Forbes Lithograph Co., Boston.
Mindora Kennedy, . . . . .	Not heard from.
John McMann, . . . . .	Lowell Carpet Co., Boston.
Hermann W. Meierhardt, . . . .	Oriental Print Works, Boston.
William V. O'Leary, . . . . .	New England Glass Co., Cambridge.
William H. C. Pierce, . . . . .	Lowell Carpet Co., Lowell.
Helen Smiley, . . . . .	Not heard from.
Florence Starbuck, . . . . .	Crayon Artist, Jamaica Plain.
Frank P. Woods, . . . . .	Mystic Print Works, Medford.

## 1880.

Marie Therese Baker, . . . . .	Oil Cloth Designer, Newton.
Lizzie F. Burnes, . . . . .	Oriental Print Works, Boston.
Mary T. F. Cook, . . . . .	Not heard from.
Abraham Doolittle, . . . . .	Not heard from.
Clarence H. Lewis, . . . . .	New England Glass Co., Cambridge.
Philip Little, . . . . .	Forbes Lithograph Co., Boston.
Frederic R. Tower, . . . . .	American Print Works, Boston.
Delphina Weston, . . . . .	Oriental Print Works, Boston.
Henry S. White, . . . . .	Lancaster Mills, Clinton.

### THE SOCIETY OF ARTS OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

The objects of this Society are to awaken and maintain an active interest in the practical sciences, and to aid generally in their advancement and development in connection with arts, agriculture, manufactures, and commerce.

The Society invites all who have any valuable knowledge of this kind, which they are willing to contribute, to attend its meetings and become members. Persons having valuable inventions or discoveries which they wish to explain will find a suitable occasion in the Society's meetings; and while the Society will never indorse by vote or diploma, or other official recognition, any invention, discovery, theory, or machine, it will give every facility to those who wish to discuss the principles and intentions of their own machines or inventions, and will endeavor at its meetings, or through properly constituted committees, to show how far any communications made to it are likely to prove of real service to the community.

This Society holds regular meetings at its rooms in the Institute Building on the second and fourth Thursdays of each month from November to May inclusive. Students of the school may be present at these meetings by permission of the Secretary.

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		Wright, John H. . . . .	Brighton.
		Wyman, Morrill . . . . .	Cambridge.

