

# CALENDAR

OF THE

## SCHOOL OF MINING

KINGSTON, ONTARIO.

\*. THIRD SESSION, \*.

1895-'96.

KINGSTON:

PRINTED AT THE BRITISH WHIG OFFICE,

1895.

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July	10—Su
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"	16—Ho
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January	7—Cl
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March	4—Pro
April	3—Ho
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## CALENDAR.

### 1895.

July 10—Summer School of Science opens.  
August 6—Summer School closes.  
September 20—Supplemental Examinations begin.  
October 1—Classes in Mining open. (1st term.)  
“ 16—Holiday.  
December 21—Christmas Holidays begin.

### 1896.

January 7—Classes re-open. (2nd term.)  
“ 7—Prospectors' Course begins.”  
February 19—Holiday.  
March 4—Prospectors' Course ends.  
April 3—Holiday.  
“ 10—Class work closes.  
“ 11—Examinations begin.  
“ 29—Convocation, for distributing prizes, announcing  
honours, and laureating graduates.

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### VISITOR.

His Honour GEORGE A. KIRKPATRICK, D.C.L., LL.D., &c.,  
Lieutenant-Governor of Ontario.

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WILLIAM MASO

N. F. DUPUIS,

JOSEPH BAWDEN

T. L. WALKER,

DR. ISAAC WOOD

WILLIAM MASO

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} Laboratory Demonstrators.

WILLIAM MASON, Bursar.

ALFRED DEAN, Janitor.

## ANNOUNCEMENT.

The SCHOOL OF MINING is a branch of the *School of Mining and Agriculture* incorporated by Act of the Legislature of Ontario.

The objects of the School of Mining are to give a thorough scientific education, both theoretical and practical, to men studying for the professions of the mining engineer, the assayer, the consulting geologist, and the metallurgist; and to provide for prospectors, mine foremen and others interested in the discovery and winning of minerals, such instruction as shall make their occupations more interesting and less liable to failures. With these ends in view the Board of Governors placed the School near Queen's University so as to take advantage of the instruction provided there in English, mathematics, physics, and the biological sciences. Kingston was chosen also as the most suitable town within easy reach of the extensive mineral regions of Eastern and Northern Ontario. Recognizing the fact that the mineral lands of Ontario require careful exploration and development, in order to lead to safe and economical mining, the governors of the school have developed the chemical, mineralogical, geological and assay departments as rapidly as possible, and have built and equipped a mining laboratory for the practical study of milling, concentrating, etc. They have also organized short practical courses in mining centres, so as to some extent to carry the opportunities afforded by the school to those whose business prevents them from attending it.

The School of Mining is open to all who wish by earnest study to enlarge their knowledge of minerals and mines, or to pursue science for its own sake. The atmosphere of the school is suitable only for those who are fond of steady work and close application.

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## REQUIREMENTS FOR ADMISSION.

REGISTRATION.—All students are required to register and pay the registration fee at the beginning of each session.

MATRICULATION. Before being admitted to examination on the work of the course, candidates for a degree must pass the matriculation examination, or otherwise satisfy the Faculty of their fitness to proceed with their course. Matriculation consists of the Junior Leaving examination for Ontario in the subjects of English and Mathematics. The details of this examination may be found in the calendars of Ontario Universities or in the Regulations of the Education Department. Other examinations will be accepted so far as they are equivalent. Candidates who have made at least fifty per cent. on the papers in any of the Senior Leaving examination subjects are not required to take the junior classes in those subjects.

Students who have already taken, in a University Arts or Science Faculty, subjects included in a degree course in the School of Mining, will be admitted to the year for which they are qualified, on entering upon a course for the degree of M.E. or B.Sc.

The B.Sc. course can be completed in one year after graduation in an honour course in chemistry, mineralogy and geology.

SPECIAL STUDENTS.—Unmatriculated students may take any classes and examinations for which they are prepared. The work in Chemistry, Mineralogy, Geology, Drawing, Surveying, etc., is so arranged that those who wish to study these subjects, either for their scientific interest or as leading to professions other than mining engineering, may profitably pursue their studies here. Special short courses are conducted during the session for prospectors and others. (See pp. 36.)



**FEES.**—Registration and Class fees must be paid annually on or before October 16, and Laboratory fees before students begin work in the laboratories.

Registration.....	\$ 1 00
For the Course in Mining: first year.....	40 00
"                    second " .....	45 00
"                    third " .....	50 00
"                    fourth " .....	55 00
Junior and Senior Chemistry, each.....	12 00
Any other Course of Lectures.....	8 00
Drawing .....	9 00
Surveying, per Session.....	5 00
Use of Assaying Laboratory for Session.....	5 00
"    Chemical Laboratory for Session.....	20 00
"    Petrographical Laboratory for Session...	5 00
Analytical Chemistry (Medical).....	12 00
Specialists' Practical Course in Qualitative Analysis, Blowpiping and Mineralogy .....	10 00
Elementary Mineralogy and Blowpiping.....	5 00
Graduation Fee.....	20 00
Annual Examination Fee.....	3 00
Tutor's Fee; Extramural Students, one subject..	5 00
"                    "                    "                    more than	
one subject.....	10 00

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## COURSES OF STUDY.

The following courses are offered :

I. Three years' courses for a diploma in

- (A.) Mining Engineering.
- (B.) Analytical Chemistry and Assaying.)

II. Four years' courses for a degree in

- (A.) Mining Engineering (M.E.)
- (B.) Chemistry and Mineralogy (P.Sc.)
- (C.) Mineralogy and Geology (B.Sc.)

III. Post-graduate courses for the degree of Doctor of Science (D.Sc.) (For further information see the calendar of Queen's University for 1894-95, p. 117.)

### I.—THREE YEARS' COURSES.

These courses are intended to fit men to enter upon the practice of mining engineering and assaying. The scientific groundwork of these professions is included as completely as the length of the course will permit; and much time is given to those practical studies which best equip the student for the work of exploration, developing, supervision, construction, etc., connected with mining. The courses are so arranged that, upon completing them, students may, if they wish, by another year's study, complete the course for a degree.

### A.—MINING ENGINEERING.

#### FIRST YEAR.

##### *First Term.*

Algebra and Geometry,  
Junior English,  
Junior Physics,  
Junior Chemistry,  
Drawing,  
Blowpipe Analysis,  
Surveying.

##### *Second Term.*

Algebra and Geometry,  
Plane Trigonometry,  
Junior English,  
Junior Physics,  
Junior Chemistry,  
Drawing,  
Blowpipe Analysis,  
Qualitative Analysis.

SECOND YEAR.

*First Term.*

Higher Algebra,  
Solid Geometry,  
Senior Physics,  
Chemistry of Metals,  
Qualitative Analysis,  
Systematic Mineralogy,  
Geology,  
Drawing and Designing,  
Mechanical Engineering.

*Second Term.*

Higher Algebra,  
Solid Geometry,  
Spherical Trigonometry,  
Senior Physics,  
Elementary Crystallography,  
Quantitative Analysis,  
Systematic Mineralogy,  
Geology,  
Drawing and Designing,  
Mechanical Engineering.

THIRD YEAR.

*First Term.*

Co-ordinate Geometry,  
Elementary Differential and  
Integral Calculus.  
Descriptive Mineralogy,  
Determinative Mineralogy,  
Geology and Petrography.  
Assaying,  
Mining,  
Ore Dressing.  
Surveying,  
Materials and Construction.

*Second Term.*

Co-ordinate Geometry,  
Elementary Differential and  
Integral Calculus.  
Optics,  
Descriptive Astronomy,  
Technical Chemistry.  
Descriptive Mineralogy,  
Determinative Mineralogy,  
Geology and Petrography,  
Assaying,  
Ore Deposits,  
Mining,  
Ore Dressing,  
Milling.

**B.—ANALYTICAL CHEMISTRY & ASSAYING.**

FIRST YEAR.

*First Term.*

Algebra and Geometry,  
Junior English,  
Junior Physics,  
Junior Chemistry,  
Drawing,  
Blowpipe Analysis,  
Surveying.

*Second Term.*

Algebra and Geometry,  
Junior English,  
Junior Physics,  
Junior Chemistry,  
Qualitative Analysis,  
Drawing,  
Blowpipe Analysis.

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Geology and  
Quantitative  
Assaying,  
Metallurgy.

SECOND YEAR.

*First Term.*

Solid Geometry,  
Adv. Algebra and Pl. Trig.  
Chemistry of Metals,  
Qualitative Analysis,  
Systematic Mineralogy.

*Second Term.*

Adv. Algebra and Pl. Trig.  
Elementary Crystallography,  
Chemical Physics,  
Qualitative Analysis,  
Systematic Mineralogy.

THIRD YEAR.

*First Term.*

Organic Chemistry,  
Crystallography,  
Descrip. and Det. Mineralogy,  
Geology and Petrography,  
Quantitative Analysis,  
Assaying,  
Metallurgy.

*Second Term.*

General Chemistry,  
Technical Chemistry,  
Descrip. and Det. Mineralogy.  
Geology and Petrography,  
Quantitative Analysis,  
Assaying,  
Metallurgy,  
Ore Deposits.

## II.—FOUR YEARS' COURSES.

These courses are arranged so as to give the extended scientific training required for the more highly specialized fields of professional work in mining, assaying, analytical chemistry, mineralogy and geology. Courses A and B may be completed in one year after completing the corresponding three years' course. Course C affords a general education in natural science with special training in mineralogical and geological work and studies. It is intended for those who have in view the profession of consulting geologist or the work of geological surveys.

### A.—MINING ENGINEERING.

The first three years of this course are the same as for the Three Years' Course. (See page 9.)

#### FOURTH YEAR.

##### *First Term.*

Quantitative Analysis,  
Assaying,  
Metallurgy,  
Economic Geology,  
Mechanism,  
Surveying,  
Electric Motors and Lighting,  
Mining Engineering,  
Milling,  
Mining Law.

##### *Second Term.*

Quantitative Analysis,  
Assaying,  
Metallurgy,  
Economic Geology,  
Mechanism,  
Surveying,  
Electric Motors and Lighting,  
Mining Engineering,  
Milling,  
Mining Law.

### B.—CHEMISTRY AND MINERALOGY.

The first three years of this course are the same as for the Three Years' Course. (See p. 10.)

#### FOURTH YEAR.

Special work along lines to be chosen by the candidate; an original research in Chemistry or Mineralogy.

First

Algebra and  
Junior English  
Junior Physics  
Junior Chemistry  
Drawing,  
Blowpipe Analysis  
Animal Biology

First

Solid Geometry  
Plane Trigonometry  
Chemistry of  
Qualitative Analysis  
Systematic Mineralogy,  
Geology,  
Surveying,

First

Crystallography  
Assaying,  
Descriptive and  
Geology and  
Topographic  
Field Geology

Petrography  
Economic Geology

Special  
original research



## C.—MINERALOGY AND GEOLOGY.

### FIRST YEAR.

#### *First Term.*

Algebra and Geometry,  
Junior English,  
Junior Physics,  
Junior Chemistry,  
Drawing,  
Blowpipe Analysis,  
Animal Biology.

#### *Second Term.*

Algebra and Geometry,  
Junior English,  
Descriptive Astronomy,  
Junior Physics,  
Junior Chemistry,  
Drawing,  
Blowpipe Analysis,  
Botany.

### SECOND YEAR.

#### *First Term.*

Solid Geometry,  
Plane Trigonometry,  
Chemistry of Metals,  
Qualitative Analysis,  
Systematic Mineralogy,  
Geology,  
Surveying,

#### *Second Term.*

Chemical Physics,  
Plane Trigonometry,  
Elementary Crystallography,  
Qualitative Analysis,  
Systematic Mineralogy,  
Geology.

### THIRD YEAR.

#### *First Term.*

Crystallography,  
Assaying,  
Descrip. and Det. Mineralogy,  
Geology and Petrography,  
Topographical Surveying,  
Field Geology,

#### *Second Term.*

Spherical Trigonometry,  
Assaying,  
Simple Quantitative Analysis,  
Descrip. and Det. Mineralogy,  
Geology and Petrography,  
Geological Maps and Sections.

### FOURTH YEAR.

Petrography,  
Economic Geology.

Petrography,  
Economic Geology.

Special work along lines to be chosen by the candidate ; an original research in Mineralogy or Geology.

## SUBJECTS OF STUDY.

### CHEMISTRY.

*Professor* : William L. Goodwin, D.Sc., Edin.

*Demonstrators* : T. W. Walker M.A., and I. Wood, M.A., M.D.

#### JUNIOR.

1. *Lectures* on the principles of Chemistry as follows:

Chemical Species—Crystals and Crystallisation—  
Chemical Change—Laws of Combination—Rela-  
tion of Heat to Chemical Changes—Notation—  
Equations—Nomenclature—Volume Relations of  
Gases in Chemical Change—Volume Formulas—  
The Atomic Theory—Descriptive Chemistry of the  
Non-metallic Elements and their Compounds—  
Electrolysis—Spectrum Analysis.

*Books* : Goodwin's Chemistry (Henderson & Co., Kingston).  
Remsen's Inorganic Chemistry (Advanced Course).  
Mondays and Tuesdays at 11 a.m.

2. *Laboratory practice*, consisting of simple experiments, by means of which the student may become acquainted with the properties of common substances. Wednesdays at 11 a.m.

3. *Qualitative Analysis* is begun in the second term.

#### SENIOR.

(1ST TERM). 1. *Lectures* on the chemistry of the metals, their occurrence in nature, reduction, and uses; and on chemical laws and theories. Thursdays and Fridays at 11 a.m.

2. *Qualitative Analysis* is continued. Notes on systematic qualitative analysis are given in a course of fifteen lectures by Professor Nicol in October.

(2ND TERM). 1. *Lectures* on elementary crystallography and chemical laws and theories. Thursdays and Fridays at 11 a.m.

2. *Qualitative Analysis of Minerals and Simple Quantitative Analysis*. This work will occupy from two to four hours a day. The greater part of the time is spent in the laboratories. *Lectures* on quantitative analysis on Thursdays at 3 p.m.

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#### (2ND TERM)

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3. *Quant*

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*Books:* Dobbin & Walker's Chemical Theory (Macmillan & Co.)  
Goodwin's Chemistry and Supplement (Henderson & Co.)  
Richter's Inorganic Chemistry (P. Blakiston, Son & Co.)  
Williams' Crystallography (Henry Holt & Co.)  
Thorpe & Muir's Qualitative Analysis (Longmans, Green & Co.)  
Fresenius' Quantitative Analysis.

THIRD YEAR.

(1ST TERM). 1. *Lectures and Class Work on Organic Chemistry.*  
The student is expected to master the contents of Remsen's Organic Chemistry.

Wednesdays at 3 p.m.

2. *Advanced Crystallography*, studied in its relation to chemistry and mineralogy. The student has access to collections of wooden and wire models, and mounted crystals.

Mondays, Tuesdays and Thursdays, at 3 p.m.

3. *Quantitative Analysis* is continued throughout the third year by students taking the courses in Chemistry and Assaying, or Chemistry and Mineralogy. Special attention is given to the quantitative analysis of minerals.

*Text Book:* Fresenius' Quantitative Analysis.

(2ND TERM). 1. *Lectures on selected subjects in Technical Chemistry.* For the session of 1895-1896 the subjects will be *Fuels, Ores and Fluxes.*

Mondays at 3 p.m.

2. *Lectures on General Chemistry.* For the session of 1895-1896 the subjects will be Thermochemistry, Electrochemistry, and Kinetic Theory of Gases.

*Text Book:* Ostwald's Outlines of General Chemistry.

Wednesdays at 3 p.m.

3. *Quantitative Analysis.*

FOURTH YEAR.

The work for the fourth year consists entirely of laboratory work in quantitative analysis. Students taking the M.E. course extend their acquaintance with analysis of minerals, slags, etc.

Those taking the B.Sc. course in chemistry and mineralogy will, in addition, carry on experimental work in some selected field, such as rock analysis, organic analysis, analysis of water, air, foods, fertilizers, soils, etc.

All students are urged to make daily use of the library, reading along the lines of their laboratory work.

#### THE CHEMICAL LABORATORIES.

The practical work in Chemistry is carried on in three laboratories: No. 1 for qualitative analysis, No. 2 for quantitative analysis, and No. 3 for experimentation in class, and drill on the subjects treated of in the junior lectures. No. 1 and No. 2 are fitted up with 62 and 42 respectively locked work places, so that 104 students can be provided each with a set of apparatus under lock and key. These laboratories are open from 8 a.m. to 5 p.m., and students are allowed to carry on their analytical work when not otherwise engaged. The number of hours a day to be spent in the laboratories depends, to some extent, on the aptitude of the student for experimentation. The average is about two and a half hours. No. 3 serves both as a laboratory and a class room. It is fitted up with seats and desks which are at the same time work tables. Besides these larger laboratories there are smaller rooms devoted to special branches of analytical chemistry and to research.

Each student, before entering any practical class in chemistry, is required to deposit five dollars with the Bursar. On presenting to the instructor of the class the receipt for this, the student receives the key of his place. The deposit is returned at the end of the session, break-ages, &c., having been deducted.

The work in the assaying chemical laboratories is quantitative analysis, conducting fire assays, forms an important part of the sample grinder and preparing larger samples prepared by hand, sieves, etc. A balance and is supplied with ore. The assay muffle furnace for (Brown pattern) muffle furnace, muffle and crucible furnaces for students for work. The laboratory is of pulverized ore of variety of ores. to ascertain its composition the analysis of iron work is carried on by Professor Ledebur, is used as a text early in the session. zinc are made by electrolysis, and ores is conducted.

The assaying of iron, and nickel, methods.

## ASSAYING.

*Professor: Wm. Nicol, M.A.*

The work of the Assaying Class is carried on partly in the assaying laboratory and partly in the quantitative chemical laboratory, as assaying is a branch of quantitative analysis. The Assay laboratory is equipped for conducting fire assays of the metallic ores. As assaying forms an important part of milling, the crusher and sample grinder of the mining laboratory are employed for preparing larger samples for assay. Smaller samples are prepared by hand, using mortars, the "buck-board," sieves, etc. A balance room adjoins the assay laboratory and is supplied with pulp balances for weighing in the ore. The assay laboratory is furnished with one large muffle furnace for soft coal, four portable coke furnaces (Brown pattern), one portable charcoal furnace, one gas muffle furnace, one gas crucible furnace, one combined muffle and crucible gas blast furnace, and three wind crucible furnaces for hard coal. The object is to prepare students for working with the different kinds of fuel. The laboratory is well supplied with ore-bins and samples of pulverized ore, so that practice may be had with a variety of ores. The work begins with an assay of coal to ascertain its commercial value. A thorough course in the analysis of iron ores by wet methods is given. The work is carried on, as far as possible, on the plan of Professor Ledebur, of Freiberg. Blair's "Analysis of Iron" is used as a text-book, supplemented by lectures delivered early in the session. The assays of copper, nickel, and zinc are made partly by the dry method, partly by electrolysis, and partly by titration. The assay of lead ores is conducted by the dry or furnace method.

The assaying of gold, silver, copper, lead, zinc, iron, and nickel ores, by furnace, wet, and electrolytic methods.



*Text-books*—Chapman's Assay Notes, (Copp-Clark Co.)  
Brown's Manual of Assaying, 5th ed. (Sargent & Co., Chicago.)  
Blair's Chemical Analysis of Iron, 2nd ed. (Lippincott Co.)  
Lord's Notes on Metallurgical Analysis.

*Books for reference:*

Beringer's Text-book of Assaying (C. Griffin & Co.)  
Bodemann & Kerl's Assaying.

**METALLURGY.**

*Professor:* William Nicol, M.A.

Lectures on ores, furnaces, fuels, and fluxes; the metallurgy of iron, steel, nickel, silver, gold, copper, lead, and aluminium.

*Text-book*—Roberts-Austen's Metallurgy.

**MINERALOGY.**

*Professor:* William Nicol, M.A.

The course in Mineralogy extends over three years. The work of the first year class is intended as a preparation for those entering upon the studies of geology, petrography, and metallurgy. The class should be taken along with the classes of junior chemistry and junior physics, as a knowledge of chemistry and physics is necessary for a proper comprehension of the subject. The work consists of lectures on the physical, optical, and other properties of minerals, the description of forty or fifty prominent Canadian minerals, followed by practical work in the determination of these. The lectures are illustrated by specimens from the lecture-cabinet, which is furnished with collections, to illustrate the physical, optical, and other properties of minerals. The practical work of the class is conducted in the mineralogical and blowpipe laboratory, where cabinets containing specimens of commonly occurring minerals are provided. The students are taught to recognize minerals by simple field tests, such as color, form, hardness, specific gravity, etc. For this work students must provide themselves with a knife, a magnet, a pocket lens, and a streak plate.

The practical instruction of so much importance of minerals, and The blowpipe laboratory apparatus for two

The work of that of the first for undertaking in the third year graphy. More of the physical properties of minerals, charts, and lanterns. For determining gravity balance, Areometer, are

The work supplemented by details see under retical work in the qualitative laboratory

The work of mineralogy, description of minerals, the descriptive made use of. In text-book in the comparisons are specimens are collection, and museum as common. Special attention minerals, as this of ore deposits. "by rote," the direct knowledge assayer, consulting

The practical work in mineralogy is supplemented by practical instruction in the use of the blowpipe, which is of so much importance in studying the chemical properties of minerals, and also as an aid to qualitative analysis. The blowpipe laboratory is furnished with the necessary apparatus for twenty-four students.

The work of the second year class is an extension of that of the first year, and is intended to prepare students for undertaking descriptive and determinative mineralogy in the third year, and as an aid in the study of petrography. More attention is given in this class to the study of the physical, optical, thermal, electrical, and other properties of minerals. Specimens, models, thin sections, charts, and lantern slides are used to illustrate the lectures. For determining the specific gravity of minerals, a specific gravity balance, a Jolly's spiral balance, and a Nicholson's Areometer, are provided for use by the students.

The work of this class—systematic mineralogy—is supplemented by a practical class in crystallography (for details see under *Chemistry*), and by practical and theoretical work in the qualitative analysis of minerals in the qualitative laboratory.

The work of the third year class consists of descriptive mineralogy, determinative mineralogy, the quantitative analysis of minerals, petrography and ore deposits. For the descriptive part the school collection of minerals is made use of. Dana's *System of Mineralogy* is used as a text-book in the class. The descriptions are read and comparisons are made with the specimens. The mineral specimens are constantly being increased by collection, donation, and purchase, the aim being to make the museum as complete and representative as possible. Special attention is given to Canadian ores and gangue minerals, as this class aids very materially in the study of ore deposits. No attempt is made to get the minerals "by rote," the desire is rather to acquire a practical working knowledge of them, such as would be useful to the assayer, consulting geologist, or mining engineer.

The work in connection with determinative mineralogy is taken in two parts: (a) practical mineralogy and (b) determination by the blowpipe. For the first part cabinets filled with specimens of minerals are provided for use. Students are permitted to handle the specimens and test them by ordinary field tests, such as form, color, hardness, etc. The object of this class is to enable students to recognize minerals in the field. Frazer's *Tables for the Determination of Minerals* is used as a guide. For the second part, practical instruction is given in the blowpipe laboratory in the determination of minerals. The object of the class is to assist students in acquiring a knowledge of the chemical properties of minerals, and to enable them to test minerals in the field, or more leisurely at home. The advantage that this class affords to the prospector and field geologist is at once apparent.

Each student is supplied with certain pieces of blowpipe apparatus, for the care of which he is held responsible. As far as possible the work of this class is carried on parallel with that in descriptive mineralogy, as the blowpipe characters form an important part in the description of every mineral.

For details of the work in quantitative analysis of minerals, see under *Chemistry*; and for details of the work in petrography and ore deposits, see under *Geology*.

*First Year.*

Blowpipe Analysis—(a) A course of practical demonstrations to illustrate and explain reactions in studying the chemical properties of minerals (one hour per week). (b) A practical class in which the experiments seen in the lectures are performed by the students (one hour per week).

*Text-book*—Chapman's *Blowpipe Practice*, 2nd ed. (Copp-Clark Co.)

*Books for reference:*

- Cornwall's Translation of Plattner's *Manual of Qualitative and Quantitative Analysis with the Blowpipe*. 7th ed. (Van Nostrand Co.)
- Endlich's *Manual of Qualitative Blowpipe Analysis*.

Brush's *Manual of Analysis*, 1st ed.  
Landauer's *Elementary*

*Students must supply*

1. Systematic Mineralogy  
*Text-book*—Bauer's *Systematic Mineralogy* (Green & Co.)  
*Books for reference*—

2. Crystallography  
Lectures on the Crystallography of natural minerals  
Williams's

3. Qualitative Analysis  
reagents.  
Lectures on Qualitative Analysis  
*Text-book*—Fresenius's

4. Essays on

1. Descriptive Mineralogy  
Tuesday  
Description of Minerals  
Ores.

*Text-book*—Dana's

*Books for reference*—

- Chester's *Analysis of Minerals*
- Chapman's *Blowpipe Practice*, 3rd ed. (Copp-Clark Co.)
- Commissioner's *Reports of the New York State Geological Survey*, 1890.

2. Determinative Mineralogy  
Practical Blowpipe Analysis  
by means of



Brush's Manual of Determinative Mineralogy and Blowpipe Analysis, 13th ed. (Wiley & Sons.)  
Landauer's Blowpipe Analysis.

*Students must supply their own blowpipe apparatus.*

*Second Year.*

1. Systematic Mineralogy.

*Text-book*—Bauerman's Systematic Mineralogy. (Longmans, Green & Co.)

*Books for reference*—Naumann-Zirkel's *Mineralogie*.

Tschermak's *Mineralogie*.

Dana's Text-book of Mineralogy, 15th ed. 1889. (John Wiley & Sons.)

2. Crystallography.

Lectures and practical study of crystal forms by means of natural crystals, and wooden and wire models.

Williams' Crystallography. (Henry Holt & Co.)

3. Qualitative Analysis of minerals by blowpipe and wet reagents.

Lectures on Qualitative Analysis.

*Text-book*—Fresenius' Qualitative Analysis.

4. Essays on prescribed subjects.

*Third Year.*

1. Descriptive Mineralogy.

Tuesday and Friday at 9 A.M.

Description and classification of the commonly occurring minerals, special attention being given to Canadian Ores. Examination of specimens from cabinets.

*Text-book*—Dana's System of Mineralogy, 6th ed. (Wiley & Sons.)

*Books for reference:*

Chester's and English's Catalogues of Minerals.

Chapman's Minerals and Geology of Ontario and Quebec. 3rd ed. (Copp-Clark Co.)

Commissioners' Report on Mineral resources of Ontario, 1890.

Reports of Bureau of Mines, 1891-94.

2. Determinative Mineralogy.

Practical instruction in the determination of minerals by means of the blowpipe and by field tests.

*Text-books*—Frazer's Tables for the Determination of Minerals, 3rd ed., 1891. (J. B. Lippincott & Co., Phila.)  
Brush's Manual of Determinative Mineralogy and Blowpipe Analysis, 13th ed. (Wiley & Sons.)

3. Quantitative Analysis of Minerals (selected samples).

*Text-book*—Fresenius' Quantitative Analysis.

#### GEOLOGY AND PETROGRAPHY.

*Lecturer*: Willet G. Miller, B.A.

The instruction in this department is adapted to the needs of the prospector, the mining engineer, and the professional geologist. Provision is also made for persons who desire a knowledge of the subject as part of a general education. Graduates and others who wish to pursue some special line of investigation, or to have the use of the laboratories and apparatus, in order to work up material collected by themselves, will have every facility placed at their disposal.

Students have access to the museum of Queen's University, which contains a large number of specimens illustrative of the geology of Canada, as well as to the collections of the school.

*Second Year.*

#### GEOLOGY.

The object of this course is to give a general knowledge of the subject as an introduction to the work of the third and fourth years.

The following themes will be treated of in the lectures:—The planetary relations of the earth; the atmosphere; waters; solid crust; probable nature of the earth's interior; rocks, their general megascopic and microscopic characters and classification; volcanic action; earthquakes; upheaval; subsidence; geological effects produced by heat, air, water, and life; bosses; dykes; veins; stratification; dip; strike; anticline and syncline; faults; foliation; nature and uses of fossils; stratigraphical geology; outline of the geological history of the globe, etc.

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The lectures are illustrated by means of maps, diagrams, and lantern views.

The laboratory work will consist of the examination of typical specimens of the different groups of fossil plants and animals, and of hand specimens of the more common rocks.

During the months of October and November excursions will be made to places of geological interest in the vicinity of Kingston.

*Text-books and books for reference.*

Le Conte's Compend of Geology.

Dana's Manual of Geology (last edition).

Chapman's Minerals and Geology of Ontario and Quebec.

*Third Year.*

GEOLOGY.

In this course special attention will be given to stratigraphical geology and the geology of Canada. Type fossils of the different formations will be studied.

*Text-books and books for reference:*

Chapman's Minerals and Geology of Ontario and Quebec.

Dawson's Geology of Canada.

Dana's Manual of Geology.

Wood's Elementary Palæontology.

Geological Survey Reports of Canada.

PETROGRAPHY.

This course will consist of lectures on the use of the petrographical microscope and accessories in the determination of the rock-forming minerals, together with the determination of some of the more common igneous rocks.

The lectures will be illustrated by means of microscopic projections of thin sections of minerals and rocks, and will be supplemented by a large amount of laboratory work.

A considerable variety of dyke rocks occurs in the Kingston district. These will be studied in the field, and specimens will be collected by each student for examination in the laboratory.

Boxes for holding slides, and material used in the preparation of sections may be obtained from the Bursar.

*Text-books and books for reference :*

- Rosenbusch-Iddings' Microscopical Physiography of Rock-Forming Minerals.
- Lewinson-Lessing's Tables for the Determination of the Rock-Forming Minerals.
- Hatch's Petrology.
- Bayley's Synopsis of Rosenbusch's Classification of Rocks.

ORE DEPOSITS.

Lectures on the origin, modes of occurrence and uses of metalliferous minerals, with mention of their chief localities. The characters by which ore bodies are sometimes indicated to the prospector will be described. A sketch will be given of the geology of some of the leading mining districts.

*Text-books and books for reference :*

- Phillips' Ore Deposits.
- Kemp's Ore Deposits of the United States.
- Mineral Statistics, Geological Surveys of Canada and the United States.
- Rothwell, The Mineral Industry. Vols. I and II.

*Fourth Year.*

GEOLOGY.

A study will be made of structural and dynamical geology in connection with their bearings on economic problems.

Opportunities will be offered for those wishing to prosecute any special line of investigation.

Students are advised to devote as much time as possible to field work during the preceding long vacation, and to collect material for study in the laboratory during the winter.

- Text-books*—Geikie's Text-Book of Geology.  
Dana's Manual of Geology.

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PETROGRAPHY.

A course of lectures will be given on the microscopic characters and classification of the igneous rocks, and on the characters, origin and classification of the Pre-Cambrian formations.

Special attention will be paid to the metamorphic series of the Kingston district, as exceptional opportunities are here offered for the study of the field relations of these rocks, and for attacking those problems as to their origin, which are now attracting the attention of geologists.

The *petrographical laboratory* will be equipped by the beginning of the session. It will be supplied with electric power and provided with diamond saws and all apparatus needed in the preparation of thin sections of minerals and rocks for examination with the microscope.

Laboratory facilities are also provided for micro-chemical tests, and for the use of heavy solutions in separating the constituents of rocks.

The school owns several petrographical microscopes of the latest and most improved designs.

*Text-books and books for reference :*

Rosenbusch—*Die Massige Gesteine*.

Zirkel—*Lehrbuch der Petrographie*. Vols. I, II and III.

Levy and Lacroix—*Les Mineraux des Roches*.

Rosenbusch-Iddings—*Microscopical Physiography of Rock-Forming Minerals*.

Iddings—*The Origin of Igneous Rocks*.

Van Hise—*Correlation Papers, Archæan and Algonkian*.

ECONOMIC GEOLOGY.

Lectures on the origin, modes of occurrence and uses of the metals and their ores; materials used in the production of light and heat; minerals used in chemical manufactures; fertilizers; mineral pigments; salt, brine and mineral waters; building materials; cements; refractory materials; abrasive materials; gems and precious stones; miscellaneous.

### MINING ENGINEERING AND ORE DRESSING.

*Lecturer:* Wm. Hamilton Merritt, F.G.S., A.R.S.M.

This course is given by lectures and text-book work, supplemented by models, drawings, photographs, the actual examination of mines, and practical work in milling, ore dressing, and sampling in the mining laboratory.

The lectures on the art of mining are designed to make the student familiar with the operations in vogue in this and other countries for finding, developing, extracting and mechanically treating minerals of economic value. It brings to a practical issue the information acquired by the lectures on mathematics, mechanics, surveying, and physics. A knowledge of chemistry and mineralogy is also necessary to give a satisfactory appreciation of the character of the ores searched for or extracted.

Connected with the mining of the ore, its geological association is considered.

This subject is covered by four courses.

The *first course* begins with the application of economic geology to the needs of the explorer or engineer, so that on the one hand he can intelligently search for, then develop a mineral deposit of economic value, and on the other hand he can study and value mining properties, locate appropriately the necessary plant and calculate the cost of production. It includes the discussion of faults and the means of finding faulted bodies, with practical problems. The subjects of blasting, timbering, and winning deposits are applied to actual cases, as driving a drift, etc., and problems from practical data are solved by the students.

The *second course* covers the subjects of underground and surface haulage, winding, loading, unloading and stocking ores, drainage or pumping, ventilation, lighting, descent and ascent, principles of employment, hygiene and mining laws and accidents. Problems are given in each of these subjects to cover cases that meet the enquirer in ordinary practice.

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The *third course* treats of the mechanical preparation of ores by the wet, dry, or magnetic methods.

The *fourth course* deals with the milling of gold and silver ores, and the sampling of ores considered especially in connection with practical work in the mining laboratory, where it is intended also to illustrate roasting, chlorination, and smelting processes.

It is expected that students will familiarize themselves with mining operations during the vacation, and arrangements will also be made for summer classes in mining regions.

The course includes the following heads, illustrated in each case by examples of the most advanced methods wherever they may be carried on, but especial mention is made of typical work which is being carried on in Canada.

*Occurrence* or manner in which the useful minerals are formed in the earth's crust. Classification of mineral deposits. Beds, strata, or seams; mineral veins or lodes; masses and their formation. Examples of the various modes of occurrence of the most important useful minerals. Irregularities in beds and veins, faults or dislocations, and rules for searching for the lost portion of a deposit. Examination and survey of mineral properties, relation of topography to geological structure, construction of maps and sections, and tracing of probable outcrops as a guide to exploration.

*Prospecting* or search for mineral deposits. Discoveries by chance or by mistake. Aid afforded by geology. Surface indications by form or colour of the ground or scattered fragments of the deposit. Decomposed outcrops of beds or veins. Association of minerals. Magnetic surveys with dip compass. Simple field tests of common ores. Prospectors' kit. Qualification of the prospector. Prospecting by pits, trenching, costeaning or husking. Importance of thorough surface prospecting work illustrated by examples.

*Boring*. Use of bore holes. Methods of boring. Percussion boring. With rods, Canadian method; with



rope, United States method. Free falling tools. Rotary boring. Earth augers. Diamond drills worked by hand or by machinery. Hydraulic boring.

*Mine Development.* Choice of methods, location of openings; opening of shafts, slopes, tunnels, or drifts; sinking of winzing, and driving of crosscuts, drifts, and adits.

*Excavation.* Hand tools, machine tools, steam diggers and dredges, hydraulic, endless chain, scoop and clam shell. Conveyance of power to machinery placed below ground. Rotatory and percussive rock worked by steam, water, compressed air, or electricity. Air compressors, hand drills; theory of blasting; method of putting in holes; explosives used in blasting; powder; nitro-glycerine; other high explosives; fulminates; directions for using and methods of firing; charging detonators; methods of firing blasts; ventilation; removal of stuff; substitutes for explosives; breaking ground by the action of water or fire; attack of ground; driving of drifts and tunnels; sinking and raising; sinking of shafts and slopes.

*Supports.* Timber; kinds of timber used for supporting excavations; dry rot; processes used for the preservation of timber; modes of timbering levels, shafts, winzes, slopes and other excavations; masonry and iron or steel supports for similar purposes; special methods of support in the case of watery and running strata; compressed air, freezing and other processes; saving of timber resulting from the adoption of caving and filling methods.

*Exploitation,* or working away minerals. Open works. Hydraulic mining. Working of deposits and support of excavations; methods applicable to deposits of different thickness, inclination and character. Coal mining, vein mining, working of thick deposits and soft-ore bodies. Salt mining.

*Transport,* or conveyance along roads. Wheelbarrows, underground tram-cars, use of ponies or horses, mechanical haulage, locomotives for use underground,

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electric railways, conveyance of minerals above ground, wire rope-ways.

*Winding*, or hoisting in shafts or along inclines. Machinery and apparatus required. Buckets, boxes, kibbles, and cages; ropes of various descriptions; pit-head frames; guides or conductors; landing on banking; safety devices and signalling; arrangements for loading and unloading cars and vessels, and for storing minerals.

*Drainage*. Preventing access of surface water; adits or drainage tunnels; siphons; removal of water by winding machinery; pumping plant; dams.

*Ventilation*. Composition of air; gases met with underground; causes of the deterioration of air; dangers of dust; natural ventilation, its advantages; ventilation by furnaces; mechanical ventilators of various kinds; distribution of air through the workings; methods of testing the purity of the air; fire-damp detectors; methods of measuring and recording the volume of the air passing through the workings.

*Lighting*. Candles; lamps fed by tallow, and by animal, vegetable or mineral oils; safety lamps; gas and electric lamps; expense of lighting.

*Descent and Ascent*. Steps and slides; ladders; winding machinery; safety appliances; man engine.

*Principles of Employment*. Day wages; contract work by weight or measure; contracts in which men have an interest in the value of the mineral extracted; administration, organization and business management; mine accounts.

*Legislation*. Special acts relating to mineral laws and the working of mines.

*Accidents*. Classification; explanation of the commonest kinds of accidents; comparison of fatalities at different kinds of mines; comparison of the miner's calling with certain other trades as regards liability to accidents.

*Examination and Valuation of Mines*.

*Miscellaneous Considerations*, such as the condition of workmen, surface plants, useful minerals in different parts of the globe, mining statistics, etc.

*Ore Dressing*. The lectures on this subject include the general principles and theory of ore dressing and the mechanical preparation of coal. Washing, packing, crushing and sizing; concentration by various methods; description of typical dressing works and coal-washing plants; magnetic separators; manufacture of patent fuel.

*Milling*. The milling of gold and silver ores will receive especial attention in connection with practical work in the mining laboratory. Physical and chemical properties of gold and of mercury, amalgam, rock-breakers, grizzlies, mortar box and its accessories, screens, dies, the stamp, tappet, stem, head, shoe, cam shaft, cams, cam curve, power, frames, guides, water supply, bins, general arrangement, ore feeders. Arrastra, Huntington Mill. Amalgamation, inside plates, copper tables, mercury wells, amalgam traps, loss of mercury; riffles, blankets, buddles, vanners, sizing, spitzkasten. Treatment of concentrates, amalgamation, chlorination, smelting, cyanidation: cleaning up, treatment of amalgam, cleaning, retorting and melting. Modes of treatment, cost of milling, general considerations. Sampling and assaying of ore, tailings, concentrates and bullion. Washoe process for silver ores; the dry process for rebellious silver ores.

At the conclusion of the course there is an excursion lasting several days to some mining district.

The student who wishes to pass in mining should spend the summer vacations of his second and third years in actual practical work underground, so as to have a general knowledge of the subject before attending the lectures. At the commencement of the mining course, each student should furnish a statement showing what practical work he has done at mines. This statement should be signed by the managers of the mines at which he has worked.

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In the final examination in mining, regard will be had to the proficiency of the student in assaying and in surveying; no student can pass in mining unless he has qualified in these two subjects.

#### MINE SURVEYING.

Practical instruction is carried on in mine surveying, including the following subjects:

- i. The measurement of distances.
- ii. The miner's dial, and its application to surveying, both at the surface and underground.
- iii. The variation of the magnetic needle.
- iv. Surveying with the magnetic needle in the presence of iron.
- v. Surveying with the fixed needle.
- vi. The German dial.
- vii. The theodolite.
- viii. Traversing underground.
- ix. Surface surveys with the theodolite.
- x. Plotting surveys.
- xi. Calculation of acres.
- xii. Levelling.
- xiii. Connection of the underground and surface surveys.

Special attention is given to field work.

#### MECHANISM.

*Lecturer:* N. F. Dupuis, M.A., F.R.S.C.

*Workshop Instructor:* .....

The instruction in mechanism is both theoretical and practical, and is given by means of lectures and the study of the actions of models, and by construction of machines, or their parts, in the mechanical workshop.

The lectures include the subjects of wheels, screws, belts, etc. The resolution of motion, cranks, and eccentrics, levers, link-work, and joint movements. Conversion of reciprocating into rotatory motion and conversely. The teeth of wheels, trains of wheels and computations; aggregate movement and miscellaneous contrivances.

Special machines are considered in some detail; such as the clock, the steam engine, the steam pump, the lathe,



the dynamo, and the motor, and various other and less important ones.

The teaching in the mechanical workshop consists of instruction in wood-working and in metal-working, in turning and in general workshop operations. Students will be required to make patterns in wood; and also to make models and parts of models in both wood and metal; and in each session the more advanced students will be set to work to construct in detail some prominent or important machine.

#### **MATERIALS AND CONSTRUCTION.**

*Professor: R. Carr Harris, C.E.*

*Fourth Year.*

Applied statics; testing of materials; properties of materials; designing and executing of engineering structures; construction of railways, canals, highways for common roads, and electric ways.

#### **DRAWING.**

*Lecturer: Wm. Mason.*

*First Year.*

Drawing instruments and materials; descriptive geometry; projection; tinting and lettering; topographical drawing.

*Second Year.*

Machine drawing; graphical statics; designing.

*Books for reference*—Davidson's Linear Drawing and Projection; Davidson's Practical Perspective; Davidson's Drawing for Machinist; Cryer & Jordan's Machine Construction and Mechanical Drawing; Thorne's Mechanical Drawing.

In each year, attendance of at least eight hours a week is required.

#### **SURVEYING.**

*Lecturer: Wm. Mason.*

*First and Second Years.*

Plane, topographical, and railway surveying; calculations; maps and scales; topographical drawing; use and adjustment of surveying instruments; methods of surveying; field work.

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*Third and Fourth Years.*

Plans, profiles, and cross sections; estimates of quantities; methods of contracting and contract payments. (See also under *Mining Engineering*.)

*Books for reference*—Gillespie's Land Surveying; Trautwine's Engineer's Pocket-Book.

The Classes in English, Mathematics, Physics and Animal Biology are taken in Queen's University.

**ENGLISH.**

*Professor*: James Cappon, M.A.

*Tutor*: W. Peck, M.A.

1. Practical course in Rhetoric and Composition.
2. Lectures on style in connection with the study of passages from Bacon, Jeremy Taylor, Sir Thomas Browne, Addison, Johnson, Burke, Macaulay.
3. A detailed study (in class) of the following works:  
Chaucer, Prologue to Canterbury Tales.  
Shakespeare, Julius Caesar.  
Carlyle, Essay on Burns.

**MATHEMATICS.**

*Professor*: Nathan F. Dupuis, M.A., F.B.S., Edin.

*Tutor*: Anna Etta Reid, M.A.

**FIRST YEAR.**

The theory and practice of Algebra to the binomial theorem inclusive. Dupuis' Algebra; the first thirteen chapters.

Geometry of the point line, and circle in the plane. Parts I. and II. of Dupuis' Synthetic Geometry.

Mondays, Wednesdays and Fridays, at 3 p.m.

(2nd term). Plane Trigonometry preceding De Moivre's theorem—Problems and applications.

Tuesdays and Thursdays at 10 a.m.

**SECOND YEAR.**

(1st term). Synthetic Solid Geometry. (Dupuis').

(2nd term). Spherical Trigonometry.

Thursdays at 3 p.m.

Higher Algebra. (First course).

Tuesdays at 4 p.m.

THIRD YEAR.

Elementary Co-ordinate Geometry.

Mondays at 11 a.m.

Elementary Differential and Integral Calculus.

Thursdays at 11 a.m.

PHYSICS.

*Professor* : D. H. Marshall, M.A., F.R.S.E.

*Tutor* : S. A. Mitchell, M.A.

JUNIOR AND SENIOR CLASSES.

Lectures and Experiments are given in the following subjects :

*Properties of Matter.*

Extension—Inertia—Mass—Density—Gravitation—Specific weight—Weight of gases—Molecular forces—Energy.

*Dynamics.*

Kinematics—Statics of solids and fluids—Kinetics of solids and fluids.

*Heat.*

Thermometry—Calorimetry (Specific and Latent Heats)—Hygrometry—Transference of heat (Conduction and Radiation)—Dynamical theory of heat.

*Light.*

General laws of Radiant Energy—Geometrical Optics—Physical Optics—Construction and use of Optical Instruments—Spectrum analysis.

*Acoustics.*

Physical Theory of Music—Optical methods of studying vibratory motions.

*Magnetism.*

With special reference to terrestrial magnetism.

*Electricity.*

Frictional Electricity—Voltaic Electricity—Thermo-Electricity—Magneto-Electricity—Electro-Magnetism—Diamagnetism—Electro-Dynamics.

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*Text-book*—Camp  
Biology.

Algebra, Geometry, and Trigonometry are applied to the solution of problems, and weekly exercises are given throughout the session.

*Text-book*—Marshall's *Introduction to the Science of Dynamics*, parts I. and II. (to be obtained from the Registrar, price \$1.00 for each part).

The following books should be used in connection with the lectures :

Deschanel's *Natural Philosophy* or Ganot's *Physics*.  
Chambers' *Mathematical Tables*.

*Junior Physics*—Mondays, Wednesdays and Fridays, at 10 a.m.

*Senior Physics*—Tuesdays and Thursdays, at 10 a.m.

#### THIRD YEAR.

##### *Optics.*

Dupuis' *Geometrical Optics* or Aldis' *Geometrical Optics*.

#### ANIMAL BIOLOGY.

*Professor* : A. P. Knight, M.A., M.D.

*Tutor* : D. Cunningham, B.A., M.D.

The course in this subject lasts from the 1st of October to the end of January. Lectures will be given on Mondays, Tuesdays and Wednesdays, 10 to 11 A.M. For laboratory work, the class will be divided into two sections, one of which will be taken on Thursdays, 10 to 12 M., and the other on Fridays, 10 to 12 M.

The lectures treat of protoplasm, cells, cell division, reproduction, early stages of development, tissues, organs. differences between animals and plants, general view of invertebrata and of vertebrata.

The laboratory work consists of such dissections and demonstrations as will elucidate the subjects of the lectures. The lectures are illustrated by diagrams, charts, and lantern transparencies.

*Text-book*—Campbell's *Introduction to the Study of Elementary Biology*. (Macmillan & Co.)

### THE MINING LABORATORY AND ORE TESTING WORKS.

The School is now provided with a *mining laboratory* and experimental reduction works, which is furnished with a stamp mill, a concentrator, a sample grinder, rolls and other machines with which ores are treated at the mines. In selecting these machines, local and provincial as well as general conditions have been kept in view. The machines are of sufficient size to operate upon large quantities of ore; and those opening up mines are invited to send in large samples of ore (a ton is a good sample) to be put through a milling process in order to test the suitability of the process for their ores. In this way costly mistakes may be avoided. The value of the mill in this respect has already been shown in several instances.

The mining laboratory is a distinctive feature of well-equipped mining schools. The various operations of crushing, stamping, grinding, amalgamating, concentrating, sampling, and assaying are, by its aid, studied in such a way as to give the student a lively appreciation of the difficulties to be overcome and the care necessary in these operations.

The plant of the mining laboratory will be added to as circumstances render additions advisable.

### PROSPECTORS' COURSE.

The School offers to mine foremen, assayers, prospectors, and mining men generally, special courses of instruction, beginning January 8th, 1896, and continuing eight weeks as follows:

1. CHEMISTRY.—A course of lectures illustrated by experiments, and forming an introduction to the study of mineralogy, geology, and assaying.

2. MINERALOGY.—Lectures dealing with the general principles of mineralogy, and accompanied by practice in identifying minerals by field tests.

3. GEOLOGY.—Lectures and illustrations from special attention.

4. LITHOLOGY.—Lectures of rocks generally, attention will be given to more typical minerals, and to specimens in the collection.

5. DISCOVERY.—Lectures of particular interest in dealing with the application of mineralogy and minerals, and to open up the department.

6. MILLING.—Lectures in the *mining laboratory* and other machinery.

7. BLOWPIPE.—Lectures in the use of the blowpipe.

8. ASSAYING.—Lectures on furnace methods and furnace.

9. MINING.—Lectures on mining to mines. Liabilities for insurance.

10. DRAWING.—Lectures on drawing as applied to mining plant, &c.

11. ADVANCE.—Lectures on work may attend to *fuels, ores, fluxes, geology*. Every student of mineralogy, petrology, &c.

FEES.—Evening classes, \$1.00 per dollar. For all other classes, fee of ten dollars. Fees for books, &c., will be in proportion to the work, and will not exceed eight dollars.

OTHER EXPENSES.—From \$3.00 to \$4.00 for books, &c.,) needed.



3. GEOLOGY.—Lectures on the elements of geology, with illustrations from the geology of Ontario. *Ore deposits* will claim special attention.

4. LITHOLOGY.—The character and modes of occurrence of rocks generally—Examination of hand specimens—Special attention will be given to the crystalline rocks of Ontario, the more typical mineral-bearing rocks being well represented by specimens in the collection.

5. DISCOVERY AND WINNING OF ORES.—This course will be of particular interest to mining men and prospectors, as it will deal with the application of the principles of chemistry, mechanics, mineralogy and geology to the discovery and winning of valuable minerals, and to the usual methods and machinery in vogue to open up the deposits, and exploit and prepare the ore.

6. MILLING.—The class will have opportunities of learning in the *mining laboratory* the use of crushers, stamp mills, and other machinery.

7. BLOWPIPING.—A practical course intended to give facility in the use of the blowpipe for the identification of minerals.

8. ASSAYING.—Opportunities will be given for practice in furnace methods, particularly in the use of the portable assay furnace.

9. MINING LAW.—Elements of customary contracts relating to mines. Examination of title. The Ontario Mines Act. Liabilities for injuries to workmen.

10. DRAWING.—The elements of mechanical and free-hand drawing as applied to surveys of mining claims and mines, to mining plant, &c.

11. ADVANCED WORK.—Those who are prepared for such work may attend (without charge) lectures on the *chemistry of fuels, ores, fluxes and furnaces*, and on *advanced mineralogy and geology*. Every facility will be given for work in the chemical, mineralogical, petrographical, and assay laboratories.

FEES.—Every student must pay a registration fee of one dollar. For all the elementary courses (No. 1 to 9 inclusive) a fee of ten dollars will be charged; for any one of them two dollars. Fees for the use of the laboratories for advanced work will be in proportion to the number of hours a week; but not to exceed eight dollars.

OTHER EXPENSES.—Good board can be had in the city at from \$3.00 to \$4.00 a week. The other items of expense (for books, &c.,) need not be large.

WM. MASON,

**SUMMER SCHOOL OF SCIENCE.**

The lectures and demonstrations will be given by members of the staff of Queen's University and of the School of Mining and Agriculture.

The object of the School is two-fold : first, to give to public school and other teachers an opportunity of studying the chemistry, mineralogy, geology, botany and zoology of the farm, as recommended by the Department of Education ; and, secondly, to enable teachers who cannot attend the University during the winter session to prepare for the practical part of the specialists' examination and the University examinations in the subjects mentioned.

**FOR PUBLIC SCHOOL TEACHERS.**

The course for public school teachers will extend over two weeks and will consist of courses of lectures, illustrated by experiments, specimens and lantern views; and of practical work in which the students may become acquainted with experimental chemistry, mineralogy, field geology and botany. Those who wish may continue the practical work two weeks more. Excursions will be made for the purpose of studying the interesting geologi-

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cal features of the region about Kingston, and of collecting and identifying plants.

*Chemistry and Physics.* A course of ten lectures dealing with the principles of chemistry and physics. The subjects will be taken up in an elementary way, with illustrations drawn from everyday life, the aim being to show the relation of chemistry and physics to the phenomena of plant and animal life, the fertility of soils, and other subjects of general interest.

*Geology and Mineralogy.* A course of ten lectures and demonstrations to illustrate the properties of common minerals, to show how these minerals are built up into rocks, and the rocks disposed in the various layers, &c., which compose the earth's crust.

*Botany.* A course of ten lectures on plant life and plant structure.

*Zoology.* A course of ten lectures on animal life, including the elements of human physiology.

*Fees.* For lectures, \$4.00; for registration, \$1.00.

#### FOR HIGH SCHOOL TEACHERS.

The laboratories of the School of Mining and of Queen's University will be open to high school teachers and others for the practical study of chemical analysis, crystallography, botany, and animal biology. Short courses of lectures will be given on such subjects as may best meet the wants of the teachers attending the school.

*Fees.* The fee for the whole course will be \$6.00; registration \$1.00.

#### SCHOLARSHIP IN MINING.

Mr. W. Bruce Carruthers has established a scholarship of the value of two hundred dollars annually, to be awarded to the student who shows himself most capable of giving assistance in the department of mining. The scholarship may be held for more than one session. The conditions of award will be made known on application to the Bursar. For session 1894-95, the Scholarship was awarded to P. Norman Nissen, of Halifax, N.S.

### MINERAL AND GEOLOGICAL SPECIMENS.

It is desired to make the collections of this School as complete and representative as possible of the mineral resources of Canada. Specimens sent to the School will be named free of charge. Good specimens presented to the School will be labelled with the name of the donor and the locality, and will be preserved for reference.

Samples under 25 lbs. in weight may be sent by express; over that weight, by freight.

Specimens should be addressed to the Professor of Mineralogy, or to the Lecturer on Geology, School of Mining, Kingston, Ont.

### DONATIONS OF MINERALS, &c.

1. Calcite, Graphic Granite and Mica. From Mr. Louis H. Chaperon, Murray Bay Mica Mine, Que.
2. Gold Quartz. From Mr. John H. Anderson, Musquodoboit Harbour, N. S.
3. Apatite, Beryl, Titanite, &c., from Sebastopol and Brudenell Townships, Renfrew Co., Ont. From Mr. Alex. Parks, Eganville, Ont.
4. Gold Ore. From Mr. O. C. Wilbur, Sonora, California.
5. Nova Scotia Coals, Nova Scotia Fossils, &c. From Mr. John Corbett, Montreal.
6. Chrome Iron Ore. From Dr. Reed, Black Lake, Que.
7. Gold Ores, &c. From Mr. E. C. Rothwell, Yarnell, Arizona.
8. Diatomaceous Earth found in Webb's Lake, Cumberland Co., N.S. Indian Arrow-head (White Quartz) found in Baie Verte River, Westmoreland Co., N.B. From Mr. E. P. Goodwin, Baie Verte, N.B.
9. Silver Lead Ores from Slocan Mining District, B.C. From Mr. Hennessey, Wolfe Island.
10. Cabinet containing Ores and Furnace products from Ferrona, N.S. Apatite from various localities. Compressed Peat Fuel. Fireman's Asbestos Suit, and many useful articles manufactured from Asbestos. Gold Ores from Nova Scotia. Mica (White India, Ruby India and N. Carolina). Mineral Paint manufactured at Limehouse, Ont. Model of Oil-Drilling

Derrick. Large  
Mr. B. T. A. Be

11. Cabinet  
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12. A 20 H.  
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13. Diamond  
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14. Machine

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(2 vols.), 1891-92  
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3. Geologic  
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4. Geologic  
with Maps. E  
New Jersey.

5. Geologic  
Annual Reports  
From Geologica

6. Geologic  
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7. Proceedi  
pamphlets (Bro  
of Science, Roch

8. Eight V  
ment of Ores.

9. Annual  
for 1894.

10. Report o  
Officers of Ontar

11. A large  
maps on mining



Derrick. Large and valuable collection of Minerals. From Mr. B. T. A. Bell, *Canadian Mining Review*, Ottawa.

11. Cabinet containing Iron Ores and Pig Iron, manufactured at Radnor. Que. From the Canada Iron Furnace Co., Limited.

12. A 20 H. P. Robb-Armstrong Steam Engine. From Robb Engineering Co., Amherst, N.S.

13. Diamond Drill Bit, Corelifter, &c. From Sullivan Machinery Co., Chicago, Ill.

14. Machinery Oil. From Vacuum Oil Co., Toronto.

#### **DONATIONS OF BOOKS, &c.**

1. Publications of the Geological and Natural History Survey of Canada; Reports, Maps, Catalogues, &c., from 1847 to 1893. From the Dominion Government.

2. United States Geological Survey Annual Reports, 1890-91 (2 vols.), 1891-92 (3 vols.); Monographs xix, xxi, xxii; Bulletins 96 to 117; Mineral Resources, 1892 and 1893; Mineral Resources (Day) 1893. From the United States Geological Survey, Washington, D.C.

3. Geological Survey of Arkansas Annual Report for 1890 (3 vols. and 1 vol. of Maps). From Sec'y State, Little Rock, Ark.

4. Geological Survey of New Jersey Annual Report for 1893, with Maps. From Geological Survey Department, Trenton, New Jersey.

5. Geological and Natural History Survey of Minnesota Annual Reports from 1872 to 1893, 6 vols. and 15 pamphlets. From Geological Survey Department of Minnesota.

6. Geological Survey of Texas, eleven pamphlets. From Department of State, Austin, Texas.

7. Proceedings of the Rochester Academy of Science, four pamphlets (Brochures of 1890-93), From Rochester Academy of Science, Rochester, N.Y.

8. Eight Volumes on Chemistry, Metallurgy, and Treatment of Ores. From Chas. Alger, Esq., Hudson, N.Y.

9. Annual Report of Board of Health of Massachusetts for 1894.

10. Report of Ninth Annual Meeting of Executive Health Officers of Ontario.

11. A large collection of valuable books, pamphlets, and maps on mining subjects. From B. T. A. Bell, Ottawa.

12. Volume of 49 Catalogues. From Fraser & Chalmers, Chicago, Ill.
13. Treatises on Surveying and Levelling Instruments; and on Mathematical Drawing and Measuring Instruments (2 vols.) From the author, Wm. F. Stanley, London, Eng.
14. Report of the Department of Mines, Nova Scotia, for year ending 30th September, 1894. From Commissioner of Works and Mines, N.S.
15. Papers of the Engineering Society of the School of Practical Science, Toronto, No. 7, 1893-94.
16. "North-West Mining Review," Spokane, Wash.
17. "Mining Review," Denver Col.
18. "Canadian Engineer," Toronto.
19. Blue Print of Engine, with two Photographs. From Robb Engineering Co., Amherst, N.S.

J. Donnelly.

Reginald In  
H. S. Baher

Reginald In

G. D. Camp

H. C. Mabe

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H. C. Mabe

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Horace C.

**EXAMINATIONS PASSED.**

**JUNIOR CHEMISTRY.**

J. Donnelly, Jr.                      T. S. Scott, B.A.

**SENIOR CHEMISTRY.**

Reginald Instant.                      Geo. D. Campbell.  
H. S. Baher.                      P. Norman Nissen.  
J. Donnelly, Jr.

**CHEMISTRY OF METALS.**

W. Lavell.

**CRYSTALLOGRAPHY.**

Reginald Instant.                      H. C. Mabee.

**MINERALOGY AND BLOWPIPING.**

G. D. Campbell.                      J. Donnelly.

**SYSTEMATIC MINERALOGY.**

H. C. Mabee.                      R. A. Instant.  
G. D. Campbell.

**QUALITATIVE ANALYSIS.**

R. A. Instant.

**QUANTITATIVE ANALYSIS AND ASSAYING.**

H. C. Mabee.                      Jno. Donnelly.

**SECOND YEAR GEOLOGY.**

H. C. Mabee.                      J. Donnelly.

**THIRD YEAR GEOLOGY.**

R. A. Instant.

**ORE DEPOSITS (ONLY).**

H. C. Mabee.                      J. Donnelly.

**DRAWING.—FIRST YEAR.**

C. LeG. Fortescue.                      Thos. S. Scott, B-A.  
Horace C. Mabee.                      John S. Potter.

DRAWING.—SECOND YEAR.

Geo. D. Campbell.

Walter Lavell.

SURVEYING.—FIRST YEAR.

John S. Potter.

Joel W. Mitchell.

McL. Geo. Spotswood.

PROSPECTORS' CLASS.

The following received certificates :—

Samuel F. V. Campbell, Kingston.

William Hall, Woodstock.

W. C. P. Heathcote, Peterborough.

Hamilton Lindsay, Kingston.

Edw. C. Musgrave, Duncans, B.C.

John Newlands, Kingston.

Eldon H. Pixley, Sydenham.

McL. George Spotswood, Kingston.

Andrew Waddell, Goderich.

Geo. H. Williams. Cataraqui.

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CALENDAR  
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KINGSTON, ONTARIO.

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"Asbestos a  
"Color in C

"Social Life

"Beet Root

"The Chees

"Nitrogen,"

## THE DAIRY SCHOOL.

The School of Mining and Agriculture, Kingston, Ont., aided by the Departments of Agriculture of the Dominion and the Province of Ontario, opened its Dairy School on Thursday, December 13th, 1894.

The School was under the management of Jas. W. Robertson, Dominion Dairy Commissioner ; and one of his assistants, J. A. Ruddick, was resident superintendent and instructor. He was assisted by L. A. Zufelt, instructor in butter making, and G. G. Publow, instructor in cheese making.

There was a series of eight regular courses, specially for cheesemakers and buttermakers who had the experience of working for at least one season at one of these branches. Each course included practical instruction, for two weeks, in either cheese making and the testing of milk, or butter making and the testing of milk. A student was allowed to take both courses. The School was open equally to male and female students.

In addition to the practical demonstrations and illustrations in the School, a course of evening lectures was given on the following subjects :

"Chemistry of Dairying," by Professor James, Deputy Minister of Agriculture.

"Carbonic Acid ; its relation to the Mineral, Plant and Animal World," by Prof. Goodwin.

"Clay and its Silvery Metal," by Prof. Goodwin.

"How Flowers make Insects work for them," by Prof. James Fowler.

"Rocks and what they are made of," by Mr. W. G. Miller.

"Entomology, a branch of Practical Agriculture," by Mr. James Fletcher, of the Experimental Farm, Ottawa.

"Asbestos and Mineral Wool," by Professor Nicol.

"Color in Chemical Study," T. L. Walker, M.A.

"Social Life of Animals," by A. P. Knight, M.A.

"Beet Root Sugar," by Mr. Robert Lawder.

"The Cheeses of the World," by Professor Ruddick.

"Nitrogen," by Professor Goodwin.

### LOCATION.

The Dairy School building is located almost in the centre of the city, and good board and lodging can be had in its vicinity at prices ranging from \$2.50 to \$3.00 per week. On reaching the city, students should take the street cars from the railway station and ask the conductor to let them off at the corner of Barrie and Union streets, near the school building.

### THE BUILDING.

The building is a model cheese and butter factory combined. It was planned in part by Professor Dupuis, after visiting the one at the Guelph College, and completed in its details by Professor Robertson, the Dominion Dairy Commissioner. The equipment includes a 20 horse power engine, 3 kinds of separators, and the newest and most approved apparatus for cheese making, butter making, and milk testing. Most of the machinery is driven by steam.

### LECTURES.

The lectures on the subjects taught are given in the building immediately adjoining the factory, and occur every morning at nine o'clock. These lectures are always subordinate to the main purpose of the school, which is to teach by demonstrations, and by requiring each student, in turn, to take part in the actual operation of making butter and cheese. From 10 A.M. to 5 P.M. is devoted to this practical work.

### NEXT SESSION.

The Board of Governors hope to have the school under the same staff of instructors next winter as it had during the past session. The exact dates of the opening of each course will be announced early in the autumn. Meanwhile applicants for admission may file their applications up to November, 1895, with Mr. William Mason, the Bursar, and after that time may send them direct to the Superintendent.

The school will open the second week in December, 1895, and close the first week in April, 1896.

The only  
must be at least

The charge  
fee of \$2.00, per  
the course.

The following  
attended the school

### NAME AND P.O.

Armstrong, H. T.,  
Bremar, Wm., Des  
Berlanguet, J. W.,  
Buell, A. W., Cain  
Brown, Lester, Ath  
Blanchard, L. F.,  
Babcock, A., Wilto  
Buro, J., Milleroch  
Bryere, A., Embro  
Burwash, J. F., Bre  
Bowers, D. Renfre  
Campbell, Geo. D.,  
Cramer, J., Glenva  
Cook, J. L., Warbu  
Cochrane, Chas., S  
Culbert, B., Athens  
Cochrane, Wm., G  
Currie, A. P., Vanc  
Chuthem, S. S.,  
Clark, Jas. F., Bald  
Cochrane, R. B., G  
Davy, G. L., Murv  
Dean, W. N., Moir  
Dean, J., Moira,  
Dougherty, Jas., El  
Dicks, C. H., Len  
Embury, Thos., Tho  
Eastman, Thos., M  
Elliott, R., Carp,  
Echlin, John, Balde  
Fairfield, H. E., Be  
Ferris, Miss E. M.,  
Free, H. R., Cold S



### ADMISSION.

The only requisite for admission is that the student must be at least 16 years of age.

### FEE.

The charge for instruction and registration, is the fee of \$2.00, payable to the Bursar, at the beginning of the course.

The following are the names of the students who attended the school during the past winter :

NAME AND P.O. ADDRESS.	NAME AND P.O. ADDRESS.
Armstrong, H. T., Manotick, Ont.	Fitch, U., Boonville, N.Y.
Breman, Wm., Deseronto, "	Ferrier, A. A., Scotch Line, Ont.
Berlanguet, J. W., Admaston, "	Fitzgerald, Wm., Yarker, "
Buell, A. W., Caintown, "	Greer, H. J., Brockville, "
Brown, Lester, Athens, "	Gould, Peter, Napanee, "
Blanchard, L. F., Athens, "	Glover, Hugh, Jones' Falls, "
Babcock, A., Wilton, "	Glasgow, W. C., Cunnamore, "
Buro, J., Milleroches, "	Gibson, G. M., Douglas, "
Bryyere, A., Embrun, "	George, John, Cataragui, "
Burwash, J.F., Brewer's Mills, "	Gagner, Jos., Embrun, "
Bowers, D. Renfrew, "	Guthrie, Wm., Perth Road, "
Campbell, Geo. D., Renfrew, "	Guthrie, Miss M., Perth Road, "
Cramer, J., Glenvale, "	Hogan, James, Mt. Chesney, "
Cook, J. L., Warburton, "	Hurst, G. A., Gananoque, "
Cochrane, Chas., Sunbury, "	Henderson, Jno., Winchester, "
Culbert, B., Athens, "	Herity, A., Moir, "
Cochrane, Wm., Glenburnie, "	Hutcheson, J.B., Sharbot Lake, "
Currie, A. P., Vancouver, B.C.	Hill, Wm., Frankville, "
Chuthem, S. S., Morton, Ont.	Hall, Wm., Woodstock, "
Clark, Jas. F., Balderson, "	Hardy, R. A., Bowerville, "
Cochrane, R. B., Glenburnie, "	Johnston, J. F., Kepler, "
Davy, G. L., Murvale, "	Jackson, Simeon, Huntington, "
Dean, W. N., Moira, "	Keenan, J. J., Kingston, "
Dean, J., Moira, "	King, D. L., Sydenham, "
Dougherty, Jas., Elginburgh, "	Kearney, Joseph, Morton, "
Dicks, C. H., Lennoxville, Que.	Kenney, Jos., Kingston, "
Embury, Thos., Thomasburg, Ont.	Keefe, D. O., Elgin, "
Eastman, Thos., Metcalfe, "	Leroux, G., Summerstown, "
Elliott, R., Carp, "	Lappin, J. J., Melcombe, "
Echlin, John, Balderson, "	Loverin, E. W. Greenbush, "
Fairfield, H. E., Belleville, "	Lennan, Barney, Godfrey, "
Ferris, Miss E. M., Elginburg, "	Lowergan, J. J., Warkworth, "
Free, H. R., Cold Springs, "	Morton, H., Moira, "

NAME AND P.O. ADDRESS.		NAME AND P.O. ADDRESS.
Morgan, J. E., Kingston,	Ont.	Stafford, W. W., Lansdowne, Ont.
Murphy, P. J., Bogart,	"	Stanley, R. J., Morton,
Mercer, J., Mallorytown,	"	Smith, P. L., Haley's Station,
McNeil, E. L., Lansdowne,	"	Spowart, Thos., Stella,
McCann, J. D., Perth,	"	Scollard, Jas., Ashdod,
McDonald, J. A., Admaston,	"	Stringer, M. P., Sand Bay,
McAlonan, Jos., Seeley's Bay,	"	Stringer, M. G., Sand Bay,
McDonald, Wm., St. Lawrence,	"	Suthall, David, Mt. Chesney,
McConnell, J. D., Dominionville,	"	Storms, C. B., Wilton,
McNamee, James, Stanleyville,	"	Smith, J. E., Sunbury,
McDonald H. A., Sunbury,	"	Sinclair, J. C., Brandon, Man.
McCowan, D., Maxville,	"	Somerville, F. J., Morton, Ont.
McRae C. F., Moore Creek,	"	Tehan, M., Westport,
Nolan, Peter, Phillipsville,	"	Totten, H., Renfrew,
Newman, J. W., Spencerville,	"	Trousdale, P. W., Sydenham,
Newman, Wm., Prescott,	"	Thurstun, R. M., Dunsford,
Pennock, J., Hartington,	"	Thompson, J., Gananoque,
Paterson, Thos. J., Sunbury,	"	Wilson, James, Carswell,
Porter, Geo., Elginburg,	"	Wellborn, Miss G., Kingston,
Redden, Ed., Portsmouth,	"	Ward, R. W., Wallbridge,
Renwick, Geo., Lang,	"	White, F., Sidney Crossing,
Raney, Neil, Mainsville,	"	Webster, M. G., Kingston,
Rice, F. A., Currie's Crossing,	"	Wilson, Wm., Renfrew,
Rone, Fred, Mt. Chesney,	"	Walroth, J. W., Maberly,

#### ATTENDANCE BY COUNTIES.

Frontenac.....	32	Students.
Leeds.....	21	"
Hastings.....	10	"
Renfrew.....	10	"
Lanark.....	6	"
Carleton.....	4	"
Glengarry.....	3	"
Grenville.....	3	"
Stormont.....	3	"
Lennox.....	3	"
Oxford.....	2	"
Russell.....	2	"
Northumberland.....	2	"
Victoria.....	1	Student.
Peterboro.....	1	"
Addington.....	1	"
Dundas.....	1	"
Manitoba.....	1	"
British Columbia.....	1	"
Quebec.....	1	"
New York State.....	1	"
Total.....	109	

COURSE B  
December 1  
December 2  
January 10  
January 24  
February 7  
February 2  
March 7th,  
March 21st,

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ATTENDANCE BY COURSES.

COURSE BEGINNING	BUTTER.		CHEESE.	
	No. of Students.		No. of Students.	
December 13th, 1894.	6		6	
December 27th, 1894.	8		10	
January 10th, 1895.	11		16	
January 24th, 1895.	8		14	
February 7th, 1895.	9		15	
February 21st, 1895.	11		14	
March 7th, 1895.	12		23	
March 21st, 1895.	6		19	
	<hr/>		<hr/>	
	71		117	

1	Student remained at the School.....	16 weeks.
1	" " " ".....	12 "
1	" " " ".....	10 "
4	" " " ".....	8 "
3	" " " ".....	6 "
22	" " " ".....	4 "

The average stay was 4 weeks.

## THE VETERINARY SCHOOL.

OPENS 1ST OCTOBER, 1895; CLOSES MARCH 21ST, 1896.

The object in establishing this department of the School of Mining and Agriculture is twofold: (1) to give to students such a knowledge of the diseases of domestic animals as will enable its graduates to practice the profession of Veterinary Surgeons, and (2) to give to farmers' sons and stock raisers such an elementary knowledge of Veterinary Science as will enable them to treat their stock intelligently, breed them scientifically, and in case of serious sickness administer temporary relief until a regularly qualified Veterinary Surgeon can be sent for.

In trying to accomplish these objects, the teaching staff will endeavor to lay a broad foundation by imparting as thorough a knowledge as possible of comparative anatomy, physiology and pathology. The latter subject will receive special attention because some contagious diseases are common to man and to the domestic animals, and other diseases which are not contagious, but caused by an animal's surroundings, develop similar symptoms and run a similar course in the lower animals as in man.

### BUILDING.

The building in which the didactic lectures on veterinary anatomy and diseases of animals will be delivered, stands at the corner of Barrie and Clergy streets and, with the grounds is the gift of the city to the School of Mining and Agriculture. The property was valued at \$20,000. The main building consists of ample class rooms, a waiting room and reading room.

### STAFF OF INSTRUCTORS.

GEO. W. BELL, V.S., V.D., Professor of Diseases of the Domestic Animals and Superintendent of Infirmary.

W. NICHOL, V.S., Professor of Veterinary Anatomy.

WM. L. GOODWIN, B.Sc. (Lond.), D.Sc. (Edin.), F.R.S.C., Professor of Chemistry School of Mining and Agriculture.

JOHN HERALD, M.  
Therape

A. P. KNIGHT, M.  
Queen's

W. T. CONNELL,  
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3. Ability to v
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Degree of V.S.....

Attendance  
\$30.00.



JOHN HERALD, M.A., M.D., Professor of Materia Medica and Therapeutics in Queen's University.

A. P. KNIGHT, M.A., M.D., Professor of Animal Biology in Queen's University.

W. T. CONNELL, M.D., F.R.C.S., Eng., Professor of Pathology in Queen's University.

### ANNOUNCEMENTS.

All students are required to register at the beginning of each session.

Students are admitted and allowed to go on with their professional studies without being subjected to any examination in general knowledge, but *before presenting themselves for the first professional examination* they will be required to undergo an examination on the following subjects:

1. Reading.
2. Arithmetic, the Simple Rules and Fractions.
3. Ability to write a letter or essay on a given subject.
4. Elementary English History and Canadian Geography.

Candidates for admission who present certificates of having passed any of the examinations of the Education Department of Ontario, or any College or University examination, or a certificate from a public school inspector or teacher of having passed the promotion examination of the 4th class of a public school, will be exempt from the above examination.

The authorities of the School retain the right of refusing to admit any intending student whose character will not bear investigation, and of refusing to re-admit any student who during the previous session has not conducted himself to their satisfaction.

### FEES.

First Session, Tuition Fee, including dissecting material..	\$60 00
Second Session, Tuition Fee, including dissecting material	60 00
Degree of V.S.....	10 00

Attendance for a third session or part of a session,  
\$30.00.

All fees are payable in advance, and must be paid by the students personally as they enrol, or be directly remitted by their parents or guardians to the Bursar, William Mason, Esq.

Board can be obtained at from \$2.50 to \$3.50 per week.

Occasional students are not required to undergo any examinations. They will be allowed to attend any one class on payment of a fee of \$12.00 per session.

Students are required to take the junior chemistry class in the School of Mining. The lectures are given in the John Carruthers Science Hall, near the University buildings. The lectures in animal biology and physiology, materia medica and therapeutics, histology and pathology are the same as those for students in medicine, and are delivered in the medical building of the University at the hours specified in the time table.

The infirmary for sick animals and the dissecting room for instruction and study in practical anatomy will be under the direction of Professor Bell and will be located on his farm at the head of Princess street.

#### COURSE OF STUDY.

The period of study extends over two winter sessions and includes a full course of lectures and demonstrations on the following subjects: Anatomy, chemistry, animal biology, including physiology, materia medica and therapeutics, normal and pathological histology, diseases of domestic animals, including veterinary dentistry and comparative pathology.

Students must attend at least 75 per cent. of the lectures on these subjects during both sessions.

Practical anatomy will be taught daily in the dissecting room under the superintendence of the professors or demonstrators. A certificate, stating the amount of dissecting done, will be given to each student at the close of the session, and no student will be allowed to present himself for his second professional examination until he has dissected the horse's body at least once.

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All students during their course will be required to discharge in turn the duties of dressers, prosectors, dispensers and visitors.

#### **SPECIAL AND EXTRA COURSE.**

At the end of each winter session there shall be an extra course of instruction (open to second year students), extending from April to June, and devoted specially to clinical medicine, clinical surgery and particularly to dentistry. This latter branch of veterinary science has become very important in recent years, and Dr. Bell has devoted much time to its study and practice.

The fee to be paid for this course by students of this department of the school will be \$25.00, but attendance is entirely optional and not necessary for graduation. The fee to students and graduates of other veterinary colleges will be \$40.00.

#### **PROFESSIONAL EXAMINATIONS.**

Before being awarded the degree in veterinary science a student must pass two professional examinations, one at the end of the first session and one at the end of the second.

The subjects of the first professional examination shall be *materia medica*, anatomy (the bones and ligaments of the common domesticated animals) animal biology and junior chemistry.

The subjects of the second professional examination are anatomy, junior physiology, *materia medica* and therapeutics, diseases of domestic animals and pathology.

Graduates or undergraduates in arts, science or medicine of any university in Canada or the United States, and graduates or undergraduates of a college of pharmacy, dentistry or agriculture, who have attended courses of lectures, and passed examinations equivalent to those required by the curriculum of this school will be allowed to graduate on completing the curriculum, paying the required class fees and passing the final examination.

### VETERINARY PRACTICE.

The lectures have been so arranged as to allow ample time for practical work under the direction of the veterinary staff, such as patient visiting, clinical instruction, examination of horses as to soundness, surgical operations, post mortem examinations, practical examination of feet for lameness, etc.

The veterinary practice in connection with the school infirmary for sick animals, and in connection with the private practice of the professors, will be such as to afford ample opportunities for students to obtain a good practical knowledge of their profession.

All the medicines used in the practice of the Infirmary will be compounded by the students under the direction of the professors. They are required to practice during the summer vacation under the supervision of a qualified practitioner.

Students will be allowed to visit the museum of the medical faculty of Queen's University, and may borrow books from the university library under the usual university regulations.

For further particulars apply to the bursar, William Mason, Esq., School of Mining and Agriculture, or to Dr. G. W. Bell, Professor of Diseases of Domestic Animals, Kingston, Ont.

### VALUE OF THE SCIENCE.

The progress of veterinary medicine, surgery and dentistry in Canada and the United States has not kept pace with the advances in other branches of science, and especially with human medicine. The public have been brought to feel strongly the want of men educated in veterinary medicine, because of the ravages lately of contagious diseases, such as epizootic, glanders, pleuro-pneumonia, texan-fever, anthrax, swine-plague, chicken-cholera, etc. The estimated loss in the United States from pleuro-pneumonia alone of more than \$10,000,000 within ten years, shows the great importance of a correct

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knowledge of such diseases. The various general diseases to which our domestic animals are continually subject are of no less importance than the contagious diseases.

The great advances made in knowledge of the etiology of the contagious diseases of man, and their intimate relation to the contagious diseases in animals, open a large and fruitful field for investigation, the importance of which can scarcely be over-estimated. It has been shown already that several of the diseases of man are transmitted to him from the lower animals, and it seems probable that the same relations exist with regard to many others. It is to the veterinarians that science looks for the elucidation of these problems. There is a large and increasing public demand for intelligent and scientific inspection of meat and milk and examination of milch-cows. Thus the field of labor for the veterinarian is a large and lucrative one, and its scope is constantly increasing. The time is not far distant when every city of ten thousand population will have a veterinary inspector of meats offered for food. It was tuberculosis and pleuro-pneumonia that deterred American cattle from being shipped to France and Germany in the last year. This latter point alone creates a large field for veterinary inspectors at every port of entry.

The post-graduate school commences about April 5th, or after the veterinary examination is over, and is for the purpose of giving graduates special instruction in clinical medicine, surgery, and veterinary dentistry, the latter of which is becoming very profitable and popular, especially in the United States. This special branch is given at the time of year best adapted for operations, and when clinical obstetrical cases in mares and cows are most numerous. The graduates shall have not only the opportunity of seeing all operations, such as spaying mares, cows, bitches, etc., castration in all its branches, including the castration of ridgling horses, also the operation for roaring or wind-broken horses, stringhalt or spasmodic jerking of the hind limb, and other

operations too numerous to mention, such as the Cæsarian operation, etc. These operations are all performed under anæsthetics, either local or by inhalation, as the case may require. At the same time, every graduate shall have the privilege of not only seeing but performing all the operations that come under veterinary surgery and dentistry under the instruction of the best Canadian and American skill.

### TEXT-BOOKS RECOMMENDED.

Students are advised not to buy text-books till after consultation with the professor who teaches the subject.

*Anatomy*.—Strangeway's Veterinary Anatomy.

*Physiology*.—Foster & Shore's Elementary Physiology.

*Histology*.—Sterling's.

*Chemistry*.—Goodwin's.

*Medicine and Surgery*.—Williams' Principles and Practice of Veterinary Medicine; Williams' Surgery; Fleming's Veterinary Obstetrics.

*Materia Medica*.—Dunn's Veterinary Medicines; Walley's Veterinary Conspectus.

*Cattle Diseases*.—Steel's Bovine Pathology; Carter's Cattle Doctor.

*Diseases of the Dog*.—Hill.

*Entozoa*.—Payne; Green.

*Dictionary*.—Gould's Medical Dictionary.

*Biology*.—Dr. Campbell's Introduction to Elementary Biology (Macmillan & Co.)

**FIRST YEAR TIME TABLE.**

9-10.	Monday, Anatomy.	Tuesday, Anatomy.	Wednesday, Anatomy.	Thursday, Anatomy.	Friday, Anatomy.
10-11.	Animal Biology and Physiology.	Animal Biology and Physiology.	Animal Biology and Physiology.	Animal Biology and Physiology.	Animal Biology and Physiology.
11-12.	Jr. Chemistry.	Jr. Chemistry.	Practical Chemistry.	Practical Biology.	Practical Biology.
1 to 3-30	Practical Anatomy.	Practical Anatomy.	Practical Anatomy.	Practical Anatomy.	Practical Anatomy.
4-5.	Materia Medica.	Materia Medica.	Materia Medica.	Materia Medica.	Materia Medica.
5-6.	Diseases of Animals.	Diseases of Animals.	Diseases of Animals.	Diseases of Animals.	Diseases of Animals.

Report



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APPENDIX.

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Reports and Financial Statements.

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**Report of  
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**Report of the Kingston School of Mining and Agriculture, Adopted at the Annual Meeting, April 18th, 1895.**

Last year's report told of the foundation of the School, of the classes taught in the mining department, and of the gift by the City Council of the old collegiate property, which, it was then stated, would enable the governors to go on with the erection of a building in which practical instruction in cheese and butter making would be imparted. This year, we have to tell of advance along the lines on which we commenced; also of the building, equipping, and running of a mining laboratory; the building, equipping, and running of a dairy school; the instituting of a summer school for teachers; an effort to open a school of navigation, which did not meet with encouragement; and arrangements perfected to begin a veterinary school next October.

**I.—THE SCHOOL OF MINES.**

The following table shows the classes taken by the students during the session 1894-5, with the names of the teaching staff and the number of students in each class:—

CLASSES.	Professor or Lecturer.	No. in Class.
Junior Chemistry.....	Prof. Goodwin.	81
Senior Chemistry.....	"	47
Chemistry of Fuel, Ores, Fluxes, &c.....	"	5
Other Departments of Honour Chemistry	"	26
Quantitative Analysis.....	"	9
Analytical Chemistry.....	Dr. Wood.	11
" " Summer School.....	"	8
Practical Chemistry.....	Mr. Walker.	62
Qualitative Analysis.....	"	10
Mineralogy, 1st year.....	Prof. Nicol.	22
" 2nd year.....	"	7
" 3rd year .....	"	4
Blowpipe Analysis.....	"	25
Determinative Mineralogy.....	"	4
Qualitative Analysis (Lectures).....	"	7
Assaying.....	"	13

Geology, 1st year.....	Prof. Miller.	20
Petrography, Field Work, &c.....	"	8
Economic Geology, Ore Deposits, &c.....	"	12
Drawing.....	Mr. Mason.	8
Elementary Surveying.....	"	3
Mining and Milling.....	Mr. H. Merritt.	2
Prospectors' Class, Mining and Milling...	"	9

The total number of students in the mining department was 197. Of these, 147 attended during the whole session, and 50 took short courses. The fees paid by students amounted to \$2,023.00, as against \$1,740.94 last year.

The success of our prospectors' class and of classes in mining centres—where the school was carried to at least some of those who could not come to Kingston—was so manifest that it was seen that two departments of practical mining were needed to solve the questions regarding the quantity of ores of economic value in Ontario, and regarding the proper treatment of those ores. The first of these questions can be determined only by diamond drill boring under scientific direction, and the second by a mining laboratory. The attention of the Government was called to these necessities and prompt action was taken. An excellent diamond drill was bought by the Bureau of Mines, and it has been operated during the winter in the neighborhood of Kingston. Its full value to the province will, however, only be had when it is worked under governmental scientific direction, and when the cores are regularly tested, and when all records made are properly preserved in the School of Mines. To meet the second necessity, the Government placed in the supplementary estimates for 1894 a vote of \$5,100 for a mining laboratory, and this amount, owing to our receiving part of the equipment as a donation from the Robb Engineering Company, Amherst, N.S., was found to be almost sufficient. The Government has provided for the necessary balance and for the running of the laboratory for the current year in the supplementary estimates just passed. The number of large samples, from 200 lbs. to five tons of

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ore, that have been sent to be crushed since the laboratory was opened in January, 1895, shows the necessity that existed for it, and how important it promises to be in practically developing the mineral wealth of the province and in ascertaining whether that wealth is of much or little account. The lots that have already been tested are from the Kaladar district, from Wahnapiatae, N.E. of Sudbury, and from a firm in Oshawa. Applications are before us with regard to lots from other places. In consequence of the establishment of this mining laboratory, Canada can now have tested, on a mining scale, all ores, the nature or value of which is doubtful, instead of as formerly being obliged to leave them untested, or to send them to Britain or the States to be tested, or to risk, and in many cases waste, capital in erecting machinery at a venture, at any spot where there were promising signs. We are in a position (1) to sample and assay ores in large lots; (2) to make mill runs and give complete reports as to free milling or the refractory nature of the ores, the amount of concentrates of the gold or silver lost in the tailings and of the bullion which can be extracted in the mill by amalgamation; (3) to instruct students in these operations.

In connection with this work, it gives the governors of the school much pleasure to report that Bruce Carruthers, Esq., has established a scholarship in mining, of the value of \$200 annually, to be awarded to the student who is most capable of assisting in the mining laboratory. The scholarship was awarded this year to P. Norman Nissen, Halifax, N.S.

We have also to thank the Government for putting in the supplementary estimates a vote to enable us to add to our equipment another chemical laboratory, required by the increase in the prospectors' class; also a mineralogical, geological and economical museum, so constructed as to be available for lecturing and lantern work; and additional apparatus, such as assay furnaces, lantern and petrographical microscopes.

To provide for the running of the mining laboratory and the prospectors' laboratories and furnaces, the annual grant which the Government makes to the school needs to be increased from \$5,000 to \$6,000. It is also indispensable to secure a professor who can give his whole time to mining engineering. With these additions, the school would be well equipped, as regards both apparatus and instructors. In view of the character of the present staff and the excellent work done on behalf of regular and occasional students, and on behalf of prospectors both at Kingston and in outside mining centres; in view also of the facts that the City of Kingston, the County of Frontenac and the public generally are liberally supporting the school, and that nowhere else in the province or, so far as we know, in Canada, is instruction given in milling and metallurgical processes on a large scale, the governors respectfully submit that it is in accordance with the more vigorous mining policy which the Government is inaugurating, and with the public interest generally, that the School of Mines should be fully equipped, as regards both staff and apparatus.

#### II.—THE DAIRY SCHOOL.

We put into the building and equipment the \$3,500 voted in the course of the last two years by the Legislature. This year the supplementary estimates give the amount needed to complete the building. We are using separators loaned by the firms that make them, and the use of these will be continued next year.

The Dairy School was opened in December and has just closed, the last week being given to home dairying.

109 students attended the school, and 16 others took advantage of the short courses in home dairying. The average stay of the 109 at the school was four weeks. 70 took courses in cheese-making only; 13 in butter-making only, and 26 in both departments. Of the students 32 came from Frontenac, 21 from Leeds, 10 from Hastings, 10 from Renfrew, 6 from Lanark, 4 each from Grenville, Stormont, Glengarry and Lennox and Addington.

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The Governors desire to cordially thank the Dominion Department of Agriculture for conducting the courses in the dairying during the past winter. Professor Robertson also gave us valuable assistance, in connection with the building and equipping of the School, according to the most approved modern methods, and by lectures and addresses which always awakened the deepest interest in the students and the public. Mr. Ruddick and his assistants proved themselves most competent practical instructors. We respectfully request the Department to lend us similar aid for another year. Nothing illustrates better the new attitude of mind with regard to this greatest industry of agriculture, than the co-operation in our School, and the kindred work connected with it, of the Provincial Government, the Dominion Government, the City of Kingston, and the County of Frontenac. We are happy to state that we have received all possible encouragement in our work from those different quarters. We have fitted up the former collegiate buildings beside the new Dairy School for theoretical and blackboard instruction, and next year we hope to give more extended instruction to skilled cheese and butter-makers, who desire to have diplomas certifying to their fitness to take charge of factories.

### III.—SUMMER SCHOOL FOR TEACHERS AND SCHOOL OF NAVIGATION.

In these departments there has not been the same success that attended our efforts in the Mining School and the Dairy School. Public school teachers did not take advantage of the rare facilities offered them, at nominal cost, to obtain a knowledge of the chemistry, botany and zoology of the farm. But a number of high school teachers and others preparing for the position of high school teachers attended, and worked zealously in the laboratories from morning to night during the six weeks' course. The total number attending was 21. Public school inspectors assigned as a reason for the non-attendance of their teachers the comparatively short notice that had been



given. We have, therefore, given adequately early advertisement of the Summer School this year, and should the attendance not be satisfactory we shall probably not continue it in 1896. In navigation, also, the number that applied was so small that it was decided to postpone opening this department till after Christmas next.

#### IV.—VETERINARY SCHOOL.

All arrangements have been made for opening this school in October next. Instruction in anatomy, materia medica, animal biology and physiology, and chemistry will be given in connection with the medical faculty of Queen's and partly in our own buildings, and ample facilities will be provided for clinical instruction in the diseases of the domestic animals in an infirmary. Details can be had on application to our bursar, W. Mason, Esq.

#### Statement of Receipts and Disbursements, School of Mining and Agriculture, for year ending March 31, 1895.

EXPENDITURE.		RECEIPTS.	
Mining Laboratory...	\$5,767 63	Cash on hand April 1,	
Dairy School.....	5,656 02	'94.....	\$1,048 61
Summer School.....	218 90	Ontario Gov't grant,	
Expense Mining School	919 90	Mining.....	5,000 00
Apparatus " "	1,993 50	Ont. Gov't grant, Dairy	3,500 00
Rent " "	1,250 00	" " Mining Lab.	5,100 00
Salaries " "	6,162 00	County Frontenac....	500 00
		Subscriptions .....	2,600 00
		Fees.....	2,249 83
		Bal. over expended...	2,149 83
	\$21,967 95		\$21,967 95
CAPITAL ACCOUNT.			
Investment .....	\$460 00	Bal. on hand April 1, '94	\$2,159 15
Over expended '94, '95.	2,069 51	Interest, etc.....	294 73
Cash on hand.....	644 37	Subscriptions 1895....	720 00
	\$3,173 88		\$3,173 88

Examined and found correct.

Kingston, April 13, 1895.

J. E. CLARK, Auditor.

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Capt. Crawford  
Sandford Flem  
J. L. Whiting,  
B. M. Britton,  
F. C. Ireland, I  
R. V. Rogers, I  
A. F. Chown, I  
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McKelvey & Bi  
J. Bell, Bellevil  
D. B. McLenna  
J. M. McLenna  
R. Campbell, I  
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A. Barnett, Ren  
J. Ferguson, R  
J. Wylie, Almo  
Wm. Russell, A  
A. Irving, Penn  
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R. J. Mackie, I  
G. M. Milligan  
W. B. Dalton,  
H. A. Calvin, I  
J. McLaren, Br  
E. W. Rathbur  
Ellen M. Nickl  
James MacLen  
W. Bruce Carr  
B. W. Robertso  
L. Clements, K  
Geo. Y. Chow  
Donald McInty  
G. M. Macdon  
Mills & Mills,  
David McLaren  
Alex. McLaren  
R. J. Tough, A  
James Dingwal  
J. Rayside, Lar  
G. W. Dawson



**SUBSCRIPTIONS PAID.**

	1894-95.	1895-96.
G. M. Grant, Kingston.....	\$200 00	\$200 00
Folger Bros., Kingston.....	100 00	
Wm. Harty, Kingston.....	100 00	
J. S. Hayden, Toronto.....	50 00	50 00
Capt. Crawford, Kingston.....	50 00	
Sandford Fleming, Ottawa.....	200 00	
J. L. Whiting, Kingston.....	10 00	
B. M. Britton, Kingston.....	10 00	
F. C. Ireland, Kingston.....	20 00	
R. V. Rogers, Kingston.....	10 00	
A. F. Chown, Kingston.....	10 00	
O. Chown, Kingston.....	10 00	
McKelvey & Birch, Kingston.....	20 00	
J. Bell, Belleville.....	50 00	
D. B. McLennan, Cornwall.....	50 00	
J. M. McLennan, est. of, Lachine.....	50 00	250 00
R. Campbell, Renfrew.....	10 00	
J. Mann, Renfrew.....	20 00	
A. Barnett, Renfrew.....	100 00	100 00
J. Ferguson, Renfrew.....	10 00	10 00
J. Wylie, Almonte.....	50 00	
Wm. Russell, Arnprior.....	10 00	10 00
A. Irving, Pembroke.....	10 00	
R. G. Scott, Pembroke.....	10 00	
T. B. Caldwell, Lanark.....	50 00	
R. J. Mackie, Kingston.....	10 00	
G. M. Milligan, Toronto.....	20 00	
W. B. Dalton, Kingston.....	10 00	
H. A. Calvin, Kingston.....	100 00	100 00
J. McLaren, Brockville.....	100 00	
E. W. Rathbun, Deseronto.....	100 00	
Ellen M. Nickle, Kingston.....	100 00	
James MacLennan, Toronto.....	50 00	
W. Bruce Carruthers, Kingston.....	30 00	
B. W. Robertson, Kingston.....	25 00	
L. Clements, Kingston.....	10 00	
Geo. Y. Chown, Kingston.....	10 00	
Donald McIntyre, Kingston.....	10 00	
G. M. Macdonnell, Kingston.....	10 00	
Mills & Mills, Kingston.....	10 00	
David McLaren, Ottawa.....	100 00	
Alex. McLaren, Buckingham.....	50 00	
R. J. Tough, Arnprior.....	25 00	
James Dingwall, Cornwall.....	25 00	
J. Rayside, Lancaster.....	10 00	
G. W. Dawson, Plevna.....	10 00	

	1894-95.	1895-96.
The Gillie Bros. Co., Braeside.....	100 00	
J. B. Carruthers, Kingston.....	200 00	
F. S. Rathbun, Deseronto.....	50 00	
M. Legatt, Hamilton.....	25 00	
S. Anglin & Co., Kingston.....	10 00	
J. B. McIver, Kingston.....	10 00	
Thos. H. Johns, Kingston.....	10 00	
Steacy & Steacy, Kingston.....	10 00	
J. B. Murphy, Kingston .....	10 00	
J. F. Dennistoun, Peterboro.....	10 00	
R. Max Dennistoun, Peterboro.....	10 00	
J. B. Williams, Peterboro.....	10 00	
Richard Hall, Peterboro.....	10 00	
W. E. Roxburg, Norwood.....	10 00	
P. R. Henderson, Kingston.....	20 00	
W. P. Hudson, Belleville.. ..	10 00	
Thos. Ritchie, Belleville.....	25 00	
James Russell, Renfrew.....	25 00	
K. M. Ireland, Kingston.....	20 00	
Total.....	\$260 00	\$720 00