EIGHTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM.

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EIGHTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM,

FOR THE YEAR ENDING 31ST DECEMBER,

1882.

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1883.

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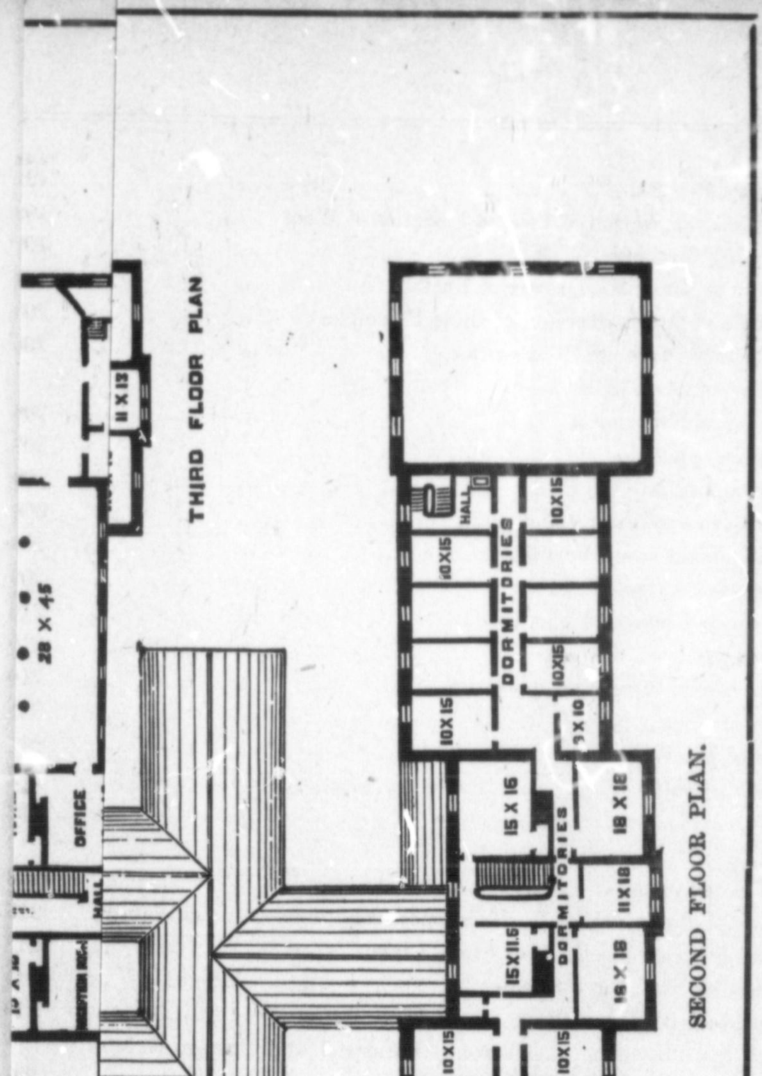

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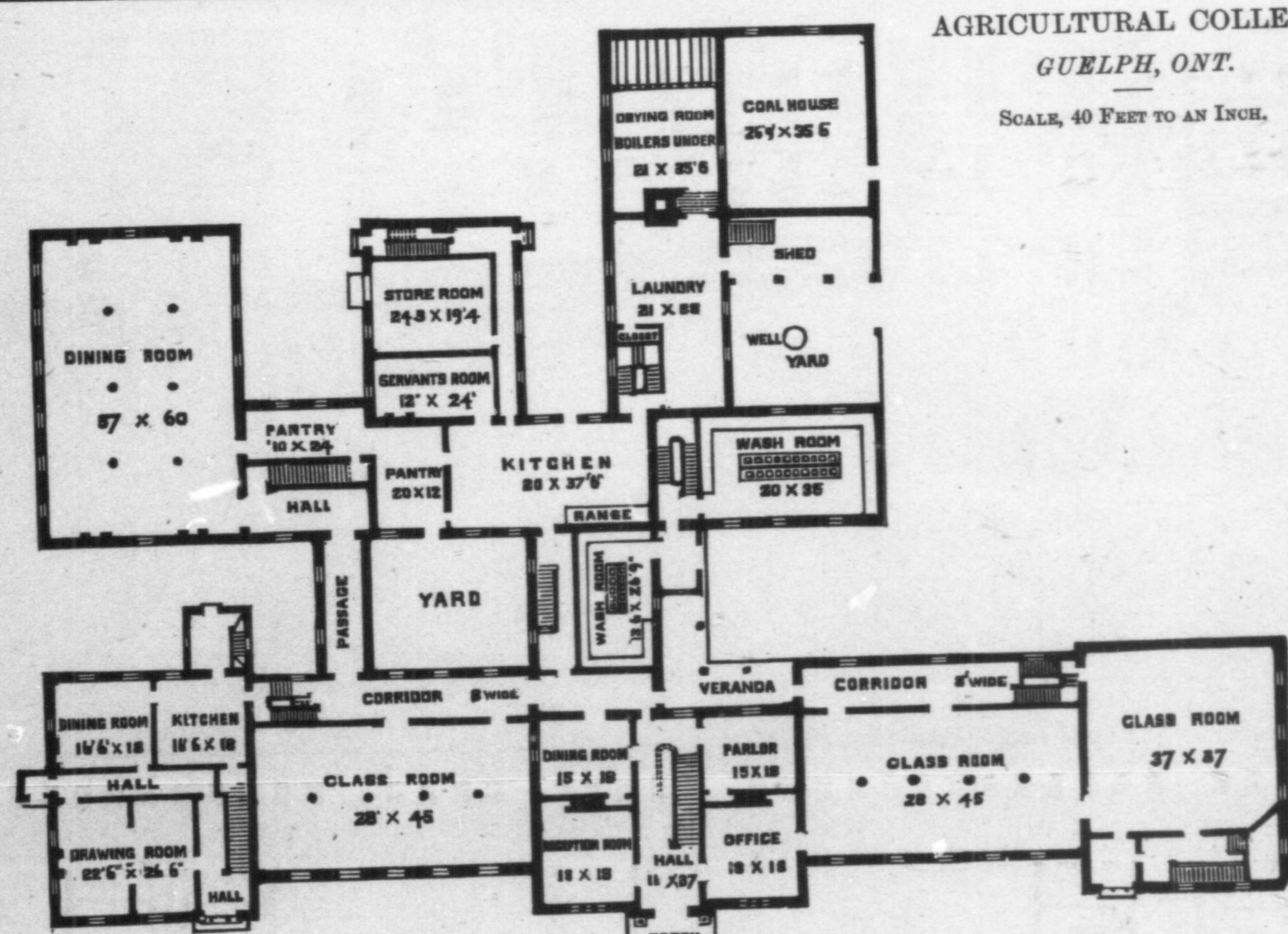

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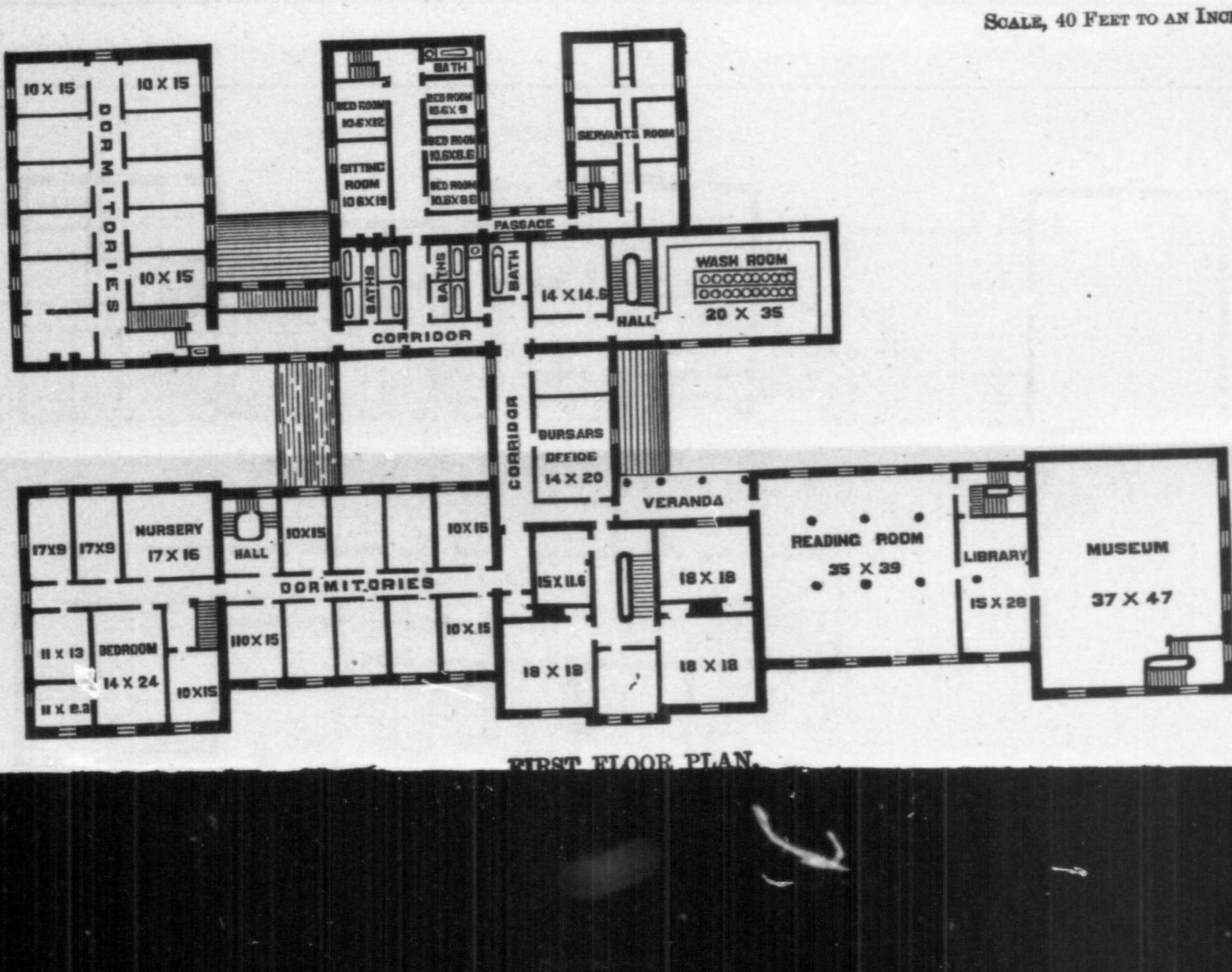

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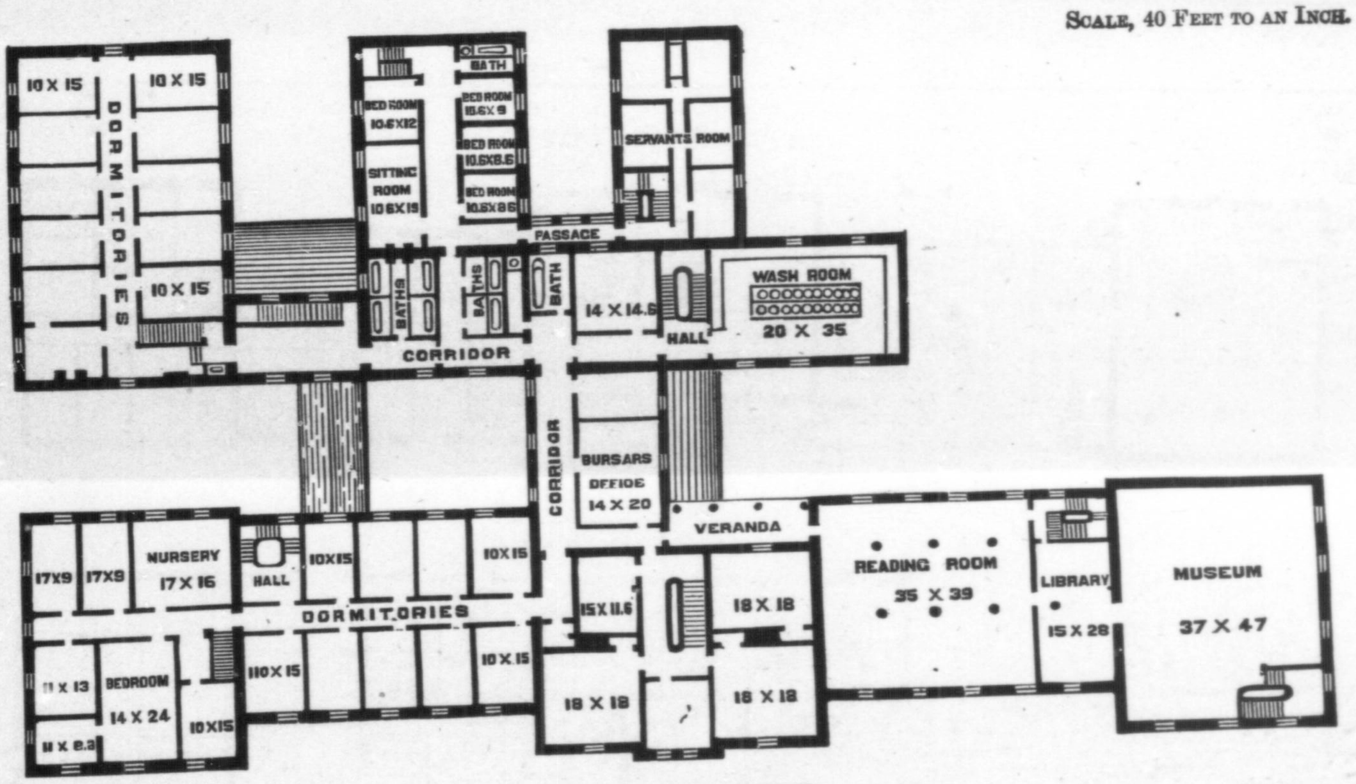

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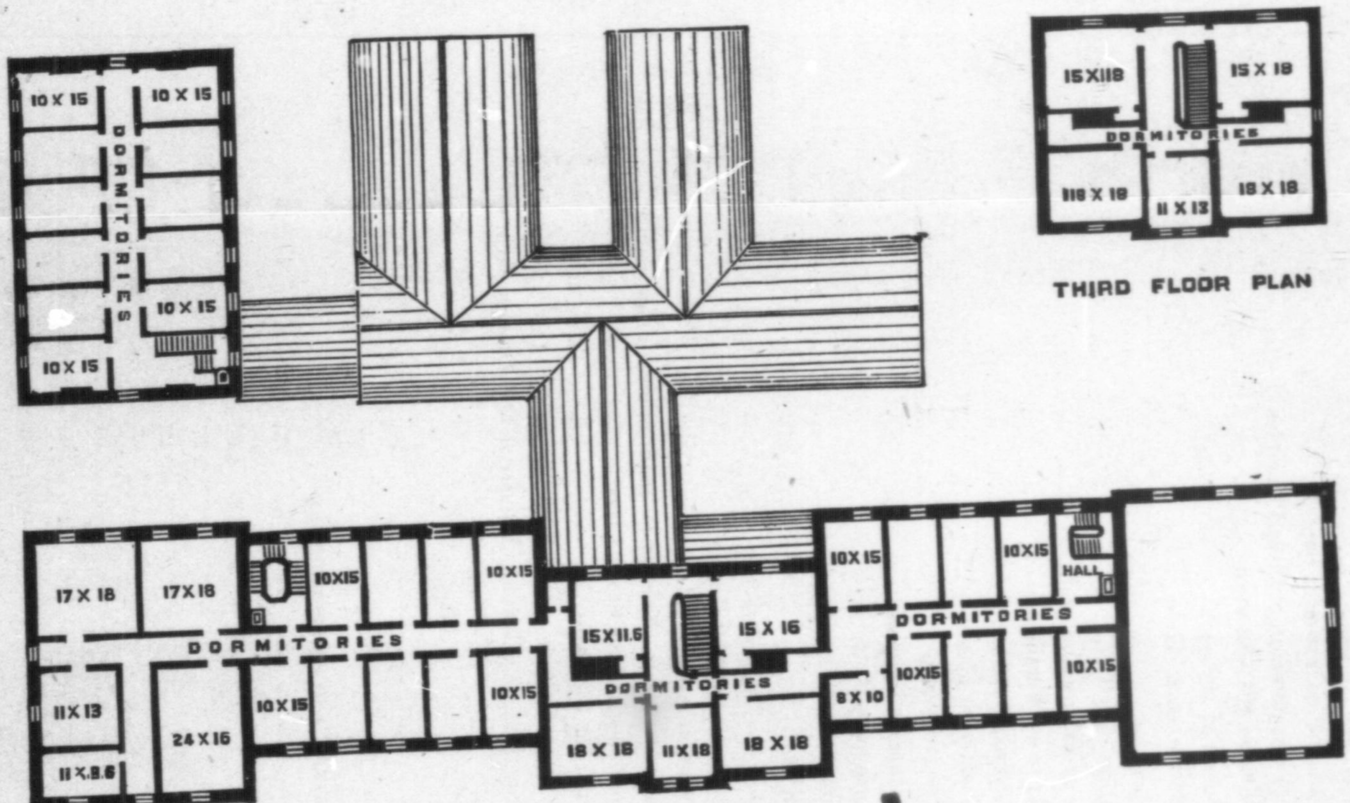

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REPORT OF THE PRESIDENT

OF THE

ONTARIO AGRICULTURAL COLLEGE,

GUELPH,

FOR THE

YEAR COMMENCING 1st JANUARY AND ENDING 31st DECEMBER,

1882.

Ontario Agricultural College,
Guelph, 2nd January, 1883.

To the Honourable S. C. Wood,
Commissioner of Agriculture for the Province of Ontario:

Sir,—In soliciting your attention to the Eighth Annual Report of the Ontario Agricultural College and Experimental Farm, I am pleased to be able to speak of steady, uninterrupted work and substantial progress in the séveral departments of the Institution. We are well aware of our deficiencies, and not unwilling to acknowledge more or less imperfection in our management. Nevertheless, we believe it will be generally admitted that the Institution is doing a good work—a work of real value to the country; and, while self-praise would be most unseemly and self-congratulation a matter of doubtful propriety, I think we are justified in saying that the rivulet whose source was so insignificant, and early course interrupted by so many obstacles, has become a very considerable stream, whose waters ars flowing silently on and may ere long expand into a river that shall bear fertility, wealth and happiness to thousands.

If nothing else, it may be fairly claimed that the attention given to the study and practice of agriculture and kindred subjects at the Ontario Agricultural College during the last seven or eight years, has contributed largely towards creating and arousing an interest in the matter of agricultural education throughout the Province, which interest I believe is destined to produce the most beneficial results on the welfare of the people at large. The farmers have begun to realize that there is no art, profession, or occupation which demands more careful study than agriculture; that special preparation is needed no less for the pursuit of agriculture than for law, medicine or divinity; and that some provision should be made for teaching the elements of so important a subject in all our rural Public Schools. The question has been discussed from time to time, and its importance set forth with more or less ability, till at length the Minister of Education has taken the first step towards carrying out the wishes and suggestions of the farming community. Agriculture has a place on the Public School programme of studies; and, although the subject is optional, the time is not far distant when every farmer's son will have the opportunity of learning, at little or no expense, some of the principles that underlie the various operations of the industry by which he has to make a living for himself and those that may be dependent on him.

Management.

The general management of the Ontario Agricultural College and Experimental Farm is divided between the President and the Farm Superintendent, who are to a large extent independent of each other. The former has full authority and control inside, and the latter outside. Each is required to work for the other; but neither is responsible for the discharge of his duties to anyone but the Commissioner of Agriculture.

The work outside is divided into five departments—

I.—The Farm Department.
II.—The Live Stock Department.
III.—The Horticultural Department.
IV.—The Mechanical Department.
V.—The Experimental Department.

For all these my colleague Professor Brown has hitherto been responsible. He has hired the men, directed the foremen, bought, sold, and done whatever else he has thought necessary for the accomplishment of the objects for which the Institution was founded; and his report, in Part VI. of this volume, contains an able and exhaustive statement of the work done in all the above departments during the past year.

The inside work, on the other hand, may be considered under three heads—

I.—The Course of Instruction in the College.
II.—The Boarding House and College Buildings.
III.—The Business Department.

For these I am directly responsible to the Commissioner of Agriculture, and indirectly to the ratepayers of the Province at large—responsible not only for the discipline and efficiency of the first, but also for the economy and general management of the second and third. Hence I beg to report as follows:—

I.—THE COURSE OF INSTRUCTION IN THE COLLEGE.

Before proceeding to the work of 1882, I shall give the sessions and terms into which the year is divided, a list of the subjects taught, and the names of the professors and lecturers, with the work allotted to each; after which I shall speak of the year's operations as a whole, and then of each term separately.

The scholastic year commences on the 1st October, and ends on the 31st August. It is divided into two sessions and each session into two terms.

Sessions.

Winter Session, embracing the Fall and Winter Terms—1st October to 31st March.

Summer Session, embracing the Spring and Summer Terms—16th April to 31st August.

Terms.

Fall Term—1st October to 22nd December.
Winter Term—5th January to 31st March.
Spring Term—16th April to 30th June.
Summer Term—1st July to 31st August.

Subjects Taught.

The regular course of study extends over a period of two years and includes the following subjects :—

First Year.—Agriculture, Live Stock, Inorganic Chemistry, Organic Chemistry, Geology and Physical Geography, Structural and Physiological Botany, Physiology, Zoology, Veterinary Anatomy, Veterinary Materia Medica, English Literature and Composition, Book-keeping, Arithmetic, and Mensuration.

Second Year.—Agriculture, Live Stock, Arboriculture, Agricultural Chemistry, Meteorology, Systematic and Economic Botany, Entomology, Horticulture, Veterinary Pathology, Veterinary Surgery and Practice, English Literature, Political Economy, Book-keeping, Mechanics, Levelling and Surveying.

Method of Instruction.

The method of instruction is chiefly by lectures. Authors are read and studied in connection with the lectures on English Literature, Political Economy, and Systematic Botany ; but in the other subjects, text-books are not used in the class-room, except for occasional reference.

The Staff.

1. James Mills, M.A., *President.*

English Literature and Political Economy.

2. William Brown, C.E., P.L.S.

Agriculture, Live Stock, and Arboriculture.

3. R. B. Hare, B.A., Ph. Dr.

Inorganic, Organic, Agricultural and Analytical Chemistry ; Geology ; Physical Geography ; Meteorology.

4. J. Playfair McMurrich, M.A.

Physiology ; Zoology ; Structural, Physiological, Systematic, and Economic Botany ; Horticulture ; Lectures on English.

5. Frederick Grenside, V.S.

Veterinary Anatomy, Pathology and Materia Medica ; Practical Handling and Judging of Horses.

6. Wm. Nattress, M.B., 1st Class A Provincial Certificate.

Arithmetic, Mensuration, Mechanics, Levelling, Surveying, and Book-keeping ; Lectures on English.

THE YEAR 1882.

The history of the College has not been characterized by anything special during the past year. The work in the different departments has gone on as usual, and the progress has been quite as satisfactory as at any former period. There has been little or no change in the class-room work, except the introduction of regular lectures on Horticulture, and the organization of a special class for the study of Live Stock and Veterinary Science.

Four new cottages have been erected, and the grounds in front of the College have been very much improved under the direction of a Special Committee appointed by the Fruit Growers of Ontario. We have had a large number of visitors from home and abroad; and the applicants for admission at the commencement of each session have been more than it has been possible for us to accommodate.

Students are admitted twice a year—on the 1st October and the 16th April. Some of those who come to the College in October return home to work on their own farms in April; and others are then admitted to fill the vacancies. Hence the total number of those whose names are registered during the year is larger than that in attendance at any particular time. The number on the roll last year was 206—1 from the United States, 1 from Cyprus, 1 from Constantinople, 1 from Manitoba, 1 from Prince Edward Island, 2 from the West Indies, 3 from Ireland, 3 from Wales, 4 from Scotland, 6 from New Brunswick, 7 from Nova Scotia, 12 from the Province of Quebec, 20 from England, and 144 from Ontario, *i.e.*, $70\frac{1}{4}$ per cent. of residents, and $29\frac{3}{4}$ per cent. of non-residents. See College Roll, appendix 1.

Counties, &c.	*Students.*	*Counties, &c.*	*Students.*
Brant	6	New Brunswick	6
Bermuda	1	Norfolk	1
Bruce	3	Northumberland	1
Carleton	5	Nova Scotia	7
Cyprus	1	Ohio	1
Durham	1	Ontario	1
Elgin	7	Ottawa	14
England	20	Oxford	9
Frontenac	1	Peel	3
Grey	5	Perth	7
Glengarry	4	Peterborough	3
Haldimand	2	Prince Edward	1
Halton	1	Prince Edward Island	1
Hamilton	5	Quebec	3
Huron	4	Simcoe	10
Ireland	3	Scotland	4
Kent	2	St. Catharines	2
Kingston	5	Toronto	5
Lambton	3	Turkey	1
Lanark	2	Waterloo	2
Leeds	3	Wales	3
Lincoln	1	Welland	1
London	1	Wentworth	3
Manitoba	1	Wellington	7
Middlesex	1	West Indies	1
Montreal	9	York	9

Total number of students in 1882	206
Number of Ontario counties represented	31

From these figures it will be seen that the County of Simcoe had the largest representation in the College last year—10 in number. The County of York had 9, Oxford 9, Elgin 7, Perth 7, Wellington 7, Brant 6, Carleton 5, and Grey 5; the City of Ottawa 14, Toronto 5, Hamilton 5, Kingston 5, and St. Catharines 2.

It may also be proper to observe that the College is patronized by members or adherents of almost every religious organization in the Dominion. Last year no less than sixteen of the recognized denominations were represented in our class-lists, as follows:—

Religious Denominations.

Episcopalian	94	Lutheran	2
Presbyterian	44	Plymouth Brethren	2
Methodist Church of Canada	34	United Brethren	1
Baptist	7	Quaker	1
Roman Catholic	7	Unitarian	1
Congregational	4	Jews	1
Episcopal Methodist	3	Universalist	1
Primitive Methodist	3	Swedenborgian	1
Total			206

Lectures commenced on the 1st October and continued throughout the first three terms of the scholastic year 1881–'82—from the 1st October to the 30th June; during which time all our regular students were engaged in class-room work and manual labour alternately—three hours a day having been spent at the former, and from three and a half to five at the latter. To this were added five hours in two weeks for set-up drill and gymnastics, under Sergeant-Major Clarke, the very efficient drill instructor of the Ontario and Wellington Field Batteries; so that the daily routine of every student in the regular course, for nine months of the year, was—

Lectures in the College, three hours a day (excepting Saturdays).

Manual labour outside, three and a half to five hours a day, according to the season of the year.

Study in room, two hours a day.

Drill and gymnastics, one hour a day (for five days of every alternate week).

While the first year students were at lectures in the College, the second year students were employed outside. Those who went out to work in the forenoon, came in for lectures in the afternoon, and *vice versa*. Thus the theoretical work inside and the practical work outside went on simultaneously during the Fall, Winter and Spring Terms. The Summer Term (1st July to 31st August) was devoted entirely to work in the outside departments—the farm, the live stock, the garden, the carpenter-shop and experiments.

In order to place systematically and clearly before the readers of this report an outline of the literary work done in the Institution, I have drawn up the following syllabus of lectures delivered by the professors in the several departments and sub-departments of study during the scholastic year, commencing on the 1st October, 1881, and ending on the 31st August, 1882:—

OUTLINE OF CLASS-ROOM WORK.

Scholastic Year 1881-82.

(*1st October to 30th June.*)

FIRST YEAR.

Fall Term—1st October to 22nd December.

Department 1.—Agriculture.

Introductory.—Ancient and modern agriculture; agricultural literature; arts and sciences affecting agriculture; different kinds of farming.

Reclamation of Land.—Clearing, stumping, stoning, fallowing, etc.

Soils.—Origin and distribution of soil; natural conditions of soil and plant; examination and classification of soils; physical and chemical properties of each kind.

Rotation in Cropping.—Importance and necessity of rotation: principles underlying it; rotations suitable to different kinds of soil; examination and criticism of different systems of rotation.

Buildings.—Location of house, barn and stables; framing a building; stables for horses, sheep and cattle; arrangement of farm buildings.

Implements and Machinery.—Principles in construction of implements and machinery; points to be aimed at; classification, examination, and description of the same.

Miscellaneous.—Roads, lanes, fences, wells, etc.

Department 2.—Science.

Chemical Physics.—Matter; accessory and essential properties of matter; attraction; various kinds of attraction—cohesion, adhesion, capillary, electrical and chemical; specific gravity; weights and measures; heat, measurement of heat, thermometers, pyrometers, specific and latent heat; sources, nature and laws of light; spectram analysis.

Inorganic Chemistry.—Scope of subject; elementary and compound substances; chemical affinity; symbols; nomenclature; combining proportions by weight and by volume; atomic theory; atomicity of the most important elements; oxygen and hydrogen; water—its nature, functions, decomposition and impurities; nitrogen; the atmosphere—its composition, uses and impurities; ammonia—its sources and uses; nitric acid and its connection with plants; carbon; combustion; carbonic acid and its relation to the animal and vegetable kingdom; sulphur and its compounds; manufacture and uses of sulphuric acid; phosphorous; phosphoric acid and its importance in agriculture; chlorine—its bleaching properties; bromine; iodine; silicon; etc.

Zoology.—Definition of terms morphology, physiology, embryology, etc.; distinctions between animate and inanimate objects; life; distinctions between plants and animals; definition of general terms; development; basis of classification; characters of the various classes, with a more detailed and special account of the porifera or sponges; actinozoa, including the formation of coral islands; trematoda, including the "liver-fluke"; cestoda, with a description of the life-history of the common tape-worm, and of the form causing "staggers" in sheep; nematoda, including thread worms, trichina, wheat anguillula, cause of gapes in chickens, etc.; acanthocephala; oligochæta—formation of mould by earth-worms; hirudinea; lamellibranchiata, including edible molluscs and pearl fisheries; gasteropoda; cephalopoda.

Department 3.—Veterinary Science.

Anatomy and Physiology of the horse, ox, sheep and pig; osseous system, muscular system, syndesmology, plantar system, and odontology.

Department 4.—English.

Lectures on Composition.—The sentence, the paragraph, and the period; capitals and punctuation; style—its qualities and varieties. *Exercises in Composition.*

English Classics.—Critical study of Goldsmith's "Deserted Village."

Department 5.—Mathematics.

Arithmetic.—Review of subject, with special reference to farm accounts; tables of weights and measures discussed; interest, discount, stocks and partnership.

Mental Arithmetic.—Calculations in simple rules, fractions, and compound rules.

FIRST YEAR—(Continued).

Winter Term—5th January to 31st March.

Department 1.—Agriculture.

Breeding, rearing, and feeding of animals. Points to be considered in deciding what kind of animals to keep.

Horses.—Different breeds of horses, and leading characteristics of each; type of horse required for farm work; breeding, feeding and general management.

Cattle.—History and characteristics of Shorthorns, Herefords, Polled Angus, Ayrshires, Jerseys, Devons, Galloways, etc.; grade cattle; milch cows—points of a good milch cow; breeding generally, cross-breeding, in-and-in breeding; pedigree;

Sheep.—Breeds of sheep generally considered; long-woolled sheep; medium-woolled sheep; short-woolled sheep; crosses between different breeds compared; texture, quality, quantity, and uses of different kinds of wool.

Swine.—Characteristics of various breeds; management of sows; stores; bacon-curing, etc.

Department 2.—Science.

Inorganic Chemistry.—Subject continued from Fall Term.

Organic Chemistry.—Constitution of organic compounds; alcohols, aldehydes, acids and their derivatives; formic, acetic, oxalic, tartaric, citric, lactic, malic, uric and tannic acids. Constitution of oils and fats—saponification; sugars, starch, cellulose; albuminoids, or flesh formers; and their allies; essential oils; alkaloids—morphine and quinine; classification of organic compounds.

Zoology.—Study of various classes continued; arthropoda, with special attention to structure and habits of the arachnida, acarina and insecta; general structure of the vertebrata; distinction between vertebrata and invertebrata; pisces; amphibia; reptilia—treating especially of the snakes and turtles; aves—habits and appearance of the more important insectivorous birds; mammalia, with special attention to the orders containing useful and domestic animals; anthropomorpha; man.

Lectures illustrated by specimens, diagrams, and drawings on the black board.

Department 3.—Veterinary Science.

Veterinary Anatomy.—Anatomy and physiology of the horse, ox, sheep, and pig—digestive system, circulatory system, respiratory system, urinary system, nervous system, sensitive system, generative system, tegumental system.

Department 4.—English.

Lectures on Composition continued.—Common mistakes in speaking and writing discussed and corrected; most important figures of speech defined and illustrated.

Exercises in Composition continued.—Exercises in synthesis; abstracts of speeches and essays; letter writing.

English Classics.—Committing to memory and critical study of Cowper's "Task," Book III.

Department 5.—Mathematics and Book-keeping.

Arithmetic.—Equation of payments; percentage; profit and loss; stocks; partnership; alligation; exchange.

Book-keeping.—Business forms and correspondence; general farm accounts; dairy, field and garden accounts.

FIRST YEAR—(Continued).

Spring Term—16th April to 30th June.

Department 1.—Agriculture.

Preparation of Soil.—Modes of preparation for different crops, as wheat, barley, oats, rye, pease, maize; modes suited to various kinds of soil.

Seeds and Sowing.—Testing the quality of seed; changing seed; quantity of seed per acre; methods of sowing.

Improvement of Lands.—Ordinary cultivation; subsoiling in some cases; fallowing; draining; manuring. Farm yard manure, and management of the same; the properties, application aud uses of artificial manures—lime, plaster, salt, bone-dust, superphosphates, etc.

Roots.—Cultivation of roots and tubers—turnips, mangolds, carrots, potatoes; effects of each kind on soil.

Green Fodders.—Tares, lucerne, sainfoin, prickley comfrey, clovers, grasses; the cultivation and management most appropriate for each.

Management of pastures; harvesting and preparing crops for markets or one's own use; crops of current year examined.

Department 2.—Science.

Geology.—Connection between geology and agriculture; classification of rocks—their origin and mode of formation, changes which they have undergone after deposition; fossils—their origin, inferences from their presence in rocks; geological periods and the characteristics of each. Geology of Canada, with special reference to the nature and economic value of the rock deposits; glacial period and its influence in the formation of soil. Lectures illustrated by numerous diagrams and specimens.

Physical Geography.—Scope of the subject—earth's place in space, external and internal conditions, atmosphere, ocean, land; superficial configuration of Ontario; theory of springs; classification of lakes; zones of animal and vegetable life.

Botany.—Derivation and definition of word; definition of morphology; vegetable physiology; botanical geography; palæophytology; history of the growth of the science; structure of plant—cells as individuals, cells aggregated into tissues; fibro-vascular bundles; roots—structure and physiology; stem—structure in exogens and endogens, growth of stem, branching, varieties of stem; leaves—structure, chlorophyll, stomata, hairs, shape, venation, compound leaves, phyllotaxis; flower—arrangement, structure, calyx, corolla, stamens, pistils, foliar nature of parts, fertilization, natural provisions for cross-fertilization, development; fruit—classification of fruits; germination of seeds. Physiology—proximate principles of plants; nutrition; metastasis; insectivorous plants; respiration; motion; heliotropism and geotropism; irritability; influence of temperature.

Lectures illustrated by specimens, diagrams and drawings on the black board.

Department 3.—Veterinary Science.

Materia Medica.—The preparation, doses, action, and uses of about one hundred of the principal medicines used in veterinary practice.

Department 4.—English.

Lectures on the subject, and class-room exercises in business correspondence, etc.

English Classics.—Committing to memory and critical study of Scott's "Marmion," Cantos V. and VI.

Department 5.—Mathematics.

Mensuration.—Mensuration of surfaces—the square, rectangle, triangle, trapezoid, regular polygon, circle, sector, segment, etc. Special application to the measurement of lumber. Mensuration of solids—tethrahedron, cube, prism, cylinder, spherical segment, spherical zone, parabolid, frustum of parabolid, spheroid, circular segment of spheroid, etc. Special application to the measurement of timber, earth, etc.

SECOND YEAR.

Fall Term—1st October to 22nd December.

Department 1.—Agriculture.

Experimental Plots.—The results of last season's experiments with wheat, oats, barley, peas, grasses, clovers, roots, etc.; liability to disease; effects of various manures on different crops; growth of plants, etc.

Farm Management.—Detailed account of the treatment of each field; results from different kinds of seed and soil; effects of manure; harvesting, storing, and threshing of crops; fall ploughing; subsoiling, etc.

Stock Feeding.—Value of feeding materials; estimate for winter keep of live stock; housing, feeding, and fattening; points to be observed in selecting animals for fattening; feeding experiments; common diseases of animals; management of animals on pasture; value of green fodder. Dairy management and cheese-making.

Department 2.—Science.

Agricultural Chemistry.—Connection between chemistry and agriculture; the various compounds which enter into the composition of the bodies of animals; the chemical changes which food undergoes during digestion; chemical changes which occur during the decomposition of the bodies of animals at death; the functions of animals and plants contrasted; food of plants, and whence derived; origin and nature of soils; classification of soils; causes of unproductiveness in soil and how detected; composition of different plants in relation to the soils upon which they grow; rotation of crops; preservation, development, and renovation of soils: manures classified, the chemical action of manures on different soils; chemical theories in reference to the action of superphosphates; the action of lime in the decomposition of double silicates; feeding of animals; classification of foods; chemical results in the use of different foods; points necessary to be considered in order to obtain the full value of artificial and natural foods.

Meteorology.—Relation of Meteorology to Agriculture; composition and movements of the atmosphere; nature and manipulation of the barometer, its importance in forecasting the weather; temperature, description of the various instruments used in its measurement and how to use them; solar and terrestrial radition; the influence of forests on climate; mists, fogs, clouds, rain, hail, and snow; description of instruments used in measuring rain and snow-fall; velocity and direction of wind; causes affecting climate; influence of climate on vegetation.

Department 3.—Veterinary Science.

Pathology.—Osseous System.—Nature, causes, symptoms, and treatment of diseases of bone, as splint, spavin, ringbone, etc.

Muscular System.—Nature, causes, and treatment of flesh wounds, etc.

Syndesmology.—Nature, causes, symptoms, and treatment of bog-spavin, curb, and other diseases of the joints.

Plantar System.—Nature, causes, symptoms and treatment of corns, sand-crack, founder, and other diseases of the foot.

Odontology.—Diseases of the teeth and treatment of the same.

Department 4.—English.

Lectures.—Etymological, syntatical, and rhetorical forms of the English language; history of its formation, its connection with other languages; rhetorical figures; their use and abuse; prose and poetic diction.

Composition.—Essay writing; familiar and business correspondence.

English Classics.—Critical study of Shakespeare's "Julius Cæsar."

Department 5.—Mathematics.

Statics.—The mechanical powers; friction; the steam engine; strength of materials; units of work; etc.

Drainage.—General principles; discharging water-ways; how, where, and when to commence draining; depth of drains and distances apart; furrow drains; draining followed by other improvements; drainage implements; levelling.

SECOND YEAR—(Continued.)

Winter Term.—5th January to 31st March.

Department 1.—Agriculture.

Laws affecting agriculture; capital required in farming, laying out of farm; general management and economy; measuring, levelling, and draining; permanent pastures; inventory and valuation; cost of production; buying, selling, and marketing; field experiments.

Management of cattle, sheep and other animals in winter; breeding generally considered; special management of ewes before, during and after the season of lambing; treatment of other animals in parturition: rearing of lambs, calves, and pigs; washing and dipping sheep, etc., etc.

Arboriculture.—Planting and attendance of forest trees, shade trees, etc.

Department 2.—Science.

Agricultural Chemistry.—Subject continued for Fall Term.

Entomology.—Importance of the study to agriculturists; natural checks to insect ravages; system of nomenclature; anatomy of insects—appendages, respiration, nutritive and nervous systems; metamorphosis; classification; beneficial and injurious insects—their habits and the best means of checking the ravages of the latter—lectures illustrated by specimens.

Department 3.—Veterinary Science.

Digestive System.—Nature, causes, symptoms, and treatment of spasmodic and flatulent colic, inflammation of the bowels, acute indigestion, tympanitis in cattle, impaction of the rumen, and many other common diseases.

Circulatory System.—Description of the diseases of the heart and blood vessels.

Respiratory System.—Nature, causes, symptoms, and treatment of catarrh, nasal-gleet, roaring, bronchitis; pleurisy, inflammation of the lungs, etc.

Urinary System.—Nature, causes, symptoms, and treatment of inflammation of the kidneys, etc.

Nervous System.—Nature, causes, symptoms, and treatment of lock-jaw, string-halt, etc.

Sensitive System.—Nature, causes, symptoms, and treatment of the diseases of the eye and ear.

Generative System.—Nature, causes, symptoms, and treatment of abortion, milk-fever, etc.

Tegumental System.—Nature, causes, symptoms, and treatment of scratches, sallenders, mallenders, parasites, and other diseases of the skin.

Department 4.—English and Political Economy.

Lectures.—Lectures on accuracy, purity, propriety, clearness, precision, strength, and grace; varieties of style described; false syntax discussed and corrected.

Composition.—Exercises in impromptu composition and letter writing continued.

English Classics.—The critical study of Shakspeare's "King Richard the Second."

Political Economy.—Utility; production of wealth—land, labour, capital; division of labour; distribution of wealth; wages; trades-unions; co-operation; money; credit, credit cycles; functions of government; taxation; etc.

Department 5.—Mathematics.

Dynamics.—Motion, forces producing motion, momentum, etc.

Hydrostatics.—Transmission of pressure; the hydraulic press; specific gravity, density; pumps, siphons, etc.

Road-Making.

SECOND YEAR—(Continued.)

Spring Term.—16th April to 30th June.

Department 1.—Agriculture.

Review of all past lectures with special drill on outside work. Reasons for management, etc.

Department 2.—Science.

Practical and Analytical Chemistry.—Chemical manipulation, preparation of common gases and reagents; operations in analysis—solution, filtration, precipitation, evaporation, distillation, sublimation, ignition, and the use of the blow-pipe; testing of substances by reagents; impurities in water; adulteration in foods and artificial manures; injurious substances in soils.

Quantitative analysis of soils, manures, and farm produce.

Systematic and Economic Botany.—Definition of the terms; importance of classification; requisites of a good classification; classification of plants, characters of the more important orders; description of source and preparation of the various economic products obtained from plants. The course was illustrated by a large collection of plants and also by practical field-work, in which various plants were examined, dissected, and classified by the students.

Horticulture.—Ontario as a fruit-growing country; influence of climate; soil, topography; source of our commoner fruits; improvement by selection; Van Mon's theory; cross fertilization—physiology, extent to which it can be carried; duration of cultivated varieties; grafting and budding—objects of operations, methods, extent to which operations can be carried; influence of graft on stocks; layering; propagation by suckers; propagation by pieces of root; pruning—objects of operation, physiology, root-pruning, other methods of producing fruitfulness; training—objects of operation, methods; transplanting—physiology, time of year to be practised, operation, mulching, manuring, laying in by the heels; winter care of plants; diseases of plants—produced by changes in the external conditions of plants, poisonous gases in the atmosphere or soil, growth of parasitic plants, injuries from insects; points to be considered in the selection of trees.

Department 3.—Veterinary Science

Materia Medica.—The preparation, actions, uses, and doses of medicines—continued from the Spring Term of the first year. Lectures on special subjects such as pleuro-pneumonia, the rinderpest, tuberculosis, etc.

Department 4.—English.

Lectures.—Taste, characteristics of taste, standard of taste; pleasures of the imagination—their sources, viz., the novel, the wonderful, the picturesque, the sublime, the beautiful; wit, humour, ridicule, etc.

Composition.—Business forms, correspondence, general letter writing, etc.

English Classics.—The critical study of Milton's "L'Allegro" and "Il Penseroso."

Department 5.—Mathematics and Book-keeping.

Surveying.—Fields surveyed with chain and cross-staff; heights and distances found by the theodolite.

Book-keeping.—Review of previous work; laws relating to farming—deeds, mortgages, notes, etc., with laws relating thereto.

Having thus spoken briefly of the year 1882, as a whole, I now proceed to report more at length on the work of each term separately. As already intimated, the scholastic year commenced on the 1st October, 1881, and ended on the 31st August, 1882, while the financial year commenced on the 1st January and ended on the 31st December; and for this reason, it is somewhat difficult to make our reports intelligible to ordinary readers. The following arrangement of the terms will, perhaps, illustrate what I mean:—

Scholastic Year	Fall Term (1881)	
Scholastic Year	Winter Term (1882)	*Financial Year.*
Scholastic Year	Spring Term "	*Financial Year.*
Scholastic Year	Summer Term "	*Financial Year.*
	Fall Term "	*Financial Year.*

From this it will be seen that the financial year embraces the last three terms of one scholastic year and the first term of another. The scholastic year commences with the Fall Term, and the financial year with the Winter Term. Hence the confusion which arises in the minds of some.

The Fall Term of 1881, *i.e.*, the first term of the scholastic year, having been treated of in last year's report, I shall begin with

THE WINTER TERM OF 1882.

(5th January to 31st March.)

The students in attendance were those who had entered at the commencement of the Fall Term in October, 1881, or previous to that date—129 in number; and the work was to a large extent a continuation of the subjects begun at that time.

Lectures.

The term was ten weeks and two days long, exclusive of the time spent in examinations; and the lectures delivered to the first-year students were 156 in number, of one hour each—thirty-one on Agriculture, thirty-two on Chemistry, twenty-one on Zoology, twenty on Veterinary Anatomy, thirty-one on English Literature and Composition, and twenty-one on Arithmetic. The second-year students had a course of 136 lectures and spent twenty hours in the practical handling and judging of cattle, sheep and horses, under the supervision of the Veterinary Surgeon and the Professor of Agriculture. The lectures were as follows: Agriculture, twenty-one; Arboriculture, five, Agricultural Chemistry, thirty-one; Entomology, eleven; Political Economy, twenty-one; English Literature, ten; Veterinary Pathology, twenty-one; Dynamics and Hydrostatics, fifteen; Road-Making, six.

Course of Apprenticeship.

Regarding the course of apprenticeship in practical work, I may say that during the past year the students were sent regularly and, with few exceptions, systematically to all the outside departments, *i.e.*, to the farm, the live stock, the garden, the carpenter-shop, and the experimental department; so that it was in the power of everyone who made a right use of his time to get a fair knowledge of whatever is to be learned in each department.

During the winter months it is sometimes difficult to find work of a kind suitable for the purposes of instruction. The experimental department furnishes but little employment; there is not much to do on the farm, and very little in the garden; consequently more time is devoted to the mechanical and live stock departments in the Winter Term than at any other season of the year. In this way the difficulty is to some extent overcome, and special opportunities are afforded the young men for learning the use of carpenters' tools, and acquiring a practical knowledge of the best methods of feeding and managing the ordinary farm animals.

Live Stock.

In this department, the first year students devoted three hours a week to the study of the characteristic points and peculiarities of the leading breeds of sheep, pigs, and horses, while the second year men spent one hour a week in handling, judging, and comparing the different breeds and varieties of sheep and cattle. The method of instruction was the same as usual, and may be described as follows:—

A specimen of some kind, say a Shorthorn steer, is brought into the lecture-room, which is so arranged with galleried seats that every student, while in his place taking notes, has a full view of the lecturer and all his movements. The different parts of the animal are first pointed out and named, such, for example, as the brisket, crops, loins, twist, etc. After this has been several times repeated, the students are called on to point out and name the several parts in presence of their class-mates. The lecturer then criticises the animal more closely, indicating the strong and the weak points, and giving his estimate of it as a whole. Afterwards several animals of different breeds are brought in together, and he proceeds to describe and illustrate what are considered the good points of an animal for beef and for milk, comparing and contrasting Shorthorns, Herefords, Aberdeen Polls, Devons, Galloways, Ayrshires, and Jerseys—breed with breed in regard to shape of frame, quality of flesh, feeding, beefing, milking, hardiness, and other properties. Much the same course is pursued with the different breeds of sheep. Cotswolds, Leicesters, Southdowns, Oxford Downs, Shropshire Downs, and Merinos are frequently examined in the class-room, and compared with one another as regards carcass, constitution, wool, mutton, feeding, hardiness, etc. Thus the instruction in this department is made in the strictest sense definite and practical.

Natural Science.

In the department of Natural Science I have to report as I did last year, that the course prescribed in the curriculum has been faithfully gone through; but that in Chemistry the results would have been better and much more satisfactory to all concerned, if the Institution had been provided with a good laboratory and apparatus suitable for making the experiments which constitute so large a part of the instruction in this important department. The professor did all that any chemist could do; but he was much hindered by the utter insufficiency of our eight by twelve laboratory and its scanty equipment.

The first year students, after completing the Inorganic Chemistry which they had studied throughout the Fall Term, took up the somewhat difficult but interesting subject of Organic Chemistry. A full course of lectures was delivered, embracing all the important organic compounds; and special attention was given to the nature and sources of sugar, starch, oils, fats, the albuminoids or flesh-formers, and other substances which have a more or less direct bearing on agriculture and stock-raising. At the same time they received lectures from another professor on Zoology, the object of which was to give them a general view of the whole animal kingdom, and thus make them more intelligent and appreciative students of particular parts of that kingdom under the heads of Entomology and Veterinary Science. While the students of the first year were thus employed, those of the second year were attending lectures on Agricultural Chemistry and Entomology. During the previous term they had learned the relation of Chemistry to Agriculture, and with this knowledge they now proceeded to study the nature and sources of plant food, the origin and properties of the different kinds of soil, their preservation and renovation, the causes of unproductiveness, artificial fertilizers and farm-yard manure, the chemical composition of various fodders, and the nutritive value of each. With such subjects as these, they were occupied three hours a week, and spent one hour a week in examining specimens of the various insects which infest our crops and fruits, and in studying the best known means of checking and preventing their ravages.

A more detailed account of the work in the several sub-departments under this head will be found in the reports of Dr. Hare and Professor McMurrich, Parts II. and III. of this volume. These reports, being more specific than anything I have said, are more interesting and instructive. They contain full information as to what is being done, and a number of suggestions regarding the work yet to be accomplished.

Veterinary Science.

As will be seen from the syllabus of lectures given on a previous page, the Winter Term in the veterinary department is devoted to the anatomy, physiology, and pathology of the horse, ox, sheep, and pig. The lectures to the first year students were on the anatomy and physiology of these animals, and were illustrated by the complete skeleton of a horse and portions of other skeletons. The second year lectures discussed various diseases and their treatment, especially the common ailments of the horse, as spavin, ringbone, curb, founder, inflammation and such like; and, for the purpose of making the instruction thoroughly practical, horses were regularly brought into the class-room and examined, first by the professor in presence of the class, and afterwards by the students themselves. Thus the veterinary surgeon was each day enabled to see whether his lectures were really understood or not by those to whom they were delivered; and the work was heartily entered into and very much appreciated by the second year men, almost without exception.

English Literature and Political Economy.

Regarding this department, I have to say as I did last year, that our course of study is still the same, and the same subjects are emphasised. We spend no time on any of the ancient or modern languages, except English; and not much on anything which has not a direct bearing on the ordinary duties of a Canadian farmer. The time may come when it will be proper to add Drawing, Elocution, and, perhaps, French or German to the list of studies; but at present it seems wise to resist the temptation in that direction. We give all the subjects of the programme a fair share of attention, but lay most stress on Agriculture, Live Stock, Chemistry and Veterinary Science. Our primary aim is to make good practical farmers; but we are not forgetful of the fact that it is no less important to make good citizens—to add some of the graces and refining influences of a broader culture, and thereby fit our students for filling positions of trust, influence, and respectability in Church and State.

The kind of education which enables a man to make the most of his abilities in the social circle, the municipality, or the political arena, is not got by confining the attention to any single object, but by reading, writing and conversation, with the sharpening and refining influences of many studies. At the same time, I think there is nothing else which contributes so much to that end, and tends so directly to create and foster a taste for reading, as frequent practice in composition and the critical reading of selections from the best English authors; and for this reason we devote all the time we can spare to exercises of that kind.

During the Winter Term of 1882, the first year students spent one hour a week in writing compositions, and two hours in the critical study of Cowper's "Task," book III.

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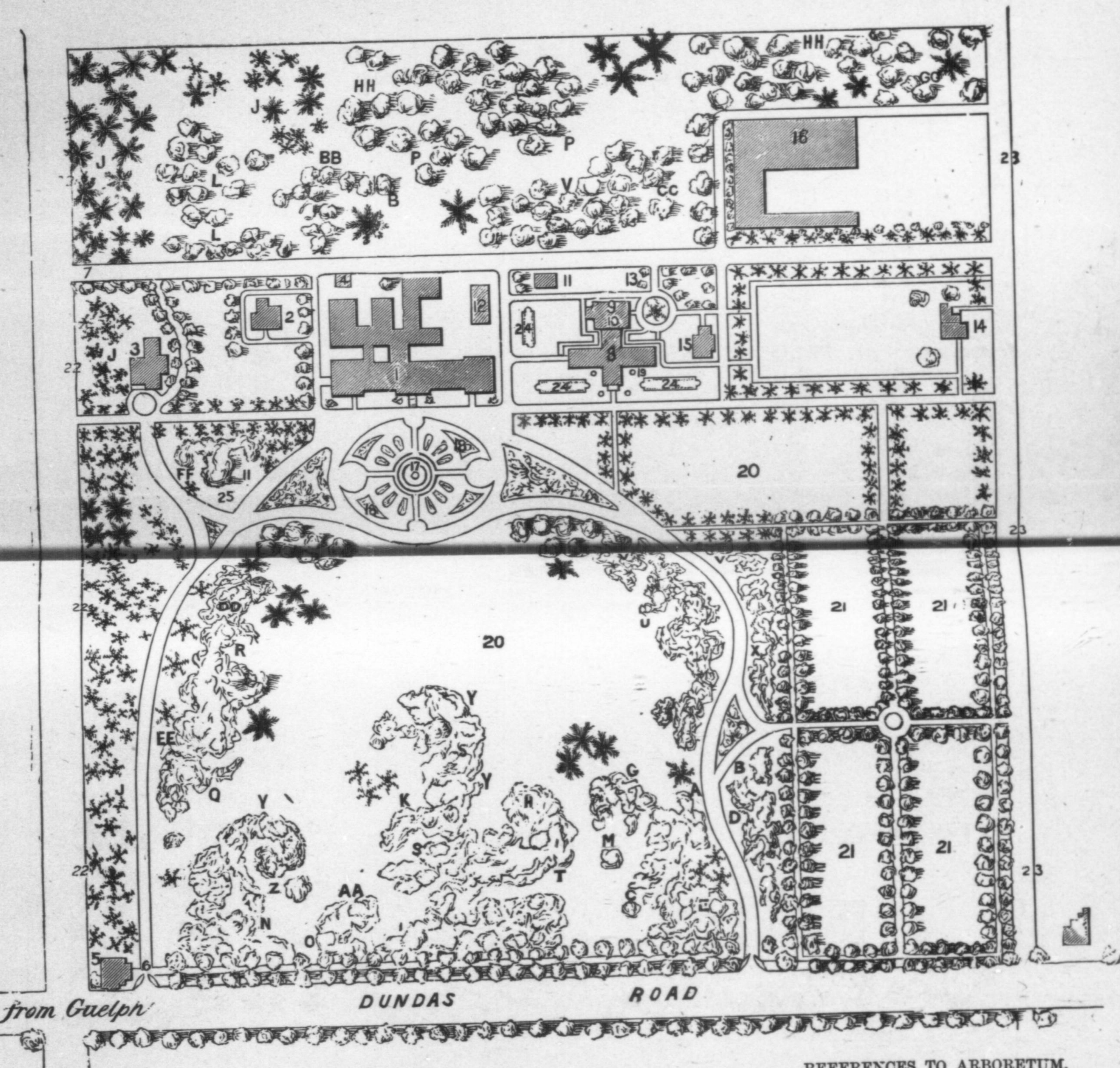


REFERENCES.

1. Main Building.
2. Bursar's House.
3. Professor's House.
4. Ice House.
5. Porter's Lodge.
6. Main Entrance.
7. Back do.
8. Greenhouse, etc.
9. Laboratory.
10. Lecture-Room.
11. Chemical Laboratory.
12. Convocation Hall.
13. Sites for proposed buildings.
14. Cottage for Farmer.
15. do Gardener.
16. Farm Buildings.
17. Fountain.
18. Flower-beds.
19. Vases.
20. Play-ground and Lawn Tennis.
21. Kitchen Garden.
22. Hedge of Norway Fir.
23. do Arbor Vitæ.
24. Sub-tropical Beds.
25. Choice Evergreens.

AGRICULTURAL COLLEGE, GUELPH.

PLAN OF GROUNDS.

Scale, 200 ft. to 1 in.

MILLER & YATES,

Landscape Gardeners,

PHILADELPHIA, PA.

REFERENCES TO ARBORETUM.

A. Anacardiaceæ..Sumach.
B. Aquifoliaceæ..Holly.
C. Araliaceæ.....Ginseng.
D. Berberaceæ....Barberry.
E. Betulaceæ....Birch.
F. Bignoniaceæ...Bignonia.
G. Calycanthaceæ..Calycanthus.
H. Caprifoliaceæ..Honeysuckle.
I. Celastraceæ...Staff-tree.
J. Coniferæ......Pine.
K. Cornaceæ......Dogwood.
L. Cupuliferæ....Oak.
M. Ericaceæ......Heath.
N. Euphorbiaceæ..Spurge.
O. Hamamidaceæ..Witch Hazel.
P. Juglandaceæ...Walnut.
Q. Lauraceæ......Laurel.
R. Leguminaceæ...Pulse or Bean.
S. Magnoliaceæ...Magnolia or Holly-hock Family.
T. Malvaceæ...Mallow.
U. Myricaceæ..Sweet Gale.
V. Oleaceæ....Olive.
W. Platanaceæ..Plane-tree.
X. Rhamnaceæ..Buck-thorn.
Y. Rosaceæ.....Rose.
Z. Rubiaceæ....Madder.
AA. Rutaceæ....Rue.
BB. Salicaceæ....Willows and Poplars.
CC. Sapindaceæ..Soapberry.
DD. Saxifrageæ..Saxifrage.
EE. Styraceæ....Storax.
FF. Tamaricaceæ..Tamarisk.
GG. Tiliaceæ....Linden.
HH. Urticaceæ....Nettle.
II. Verbenaceæ..Verbena or Vervain.

AGRICULTURAL COLLEGE, GUELPH.—PERSPECTIVE VIEW OF CONSERVATORY, GREENHOUSE AND LECTURE-ROOM.

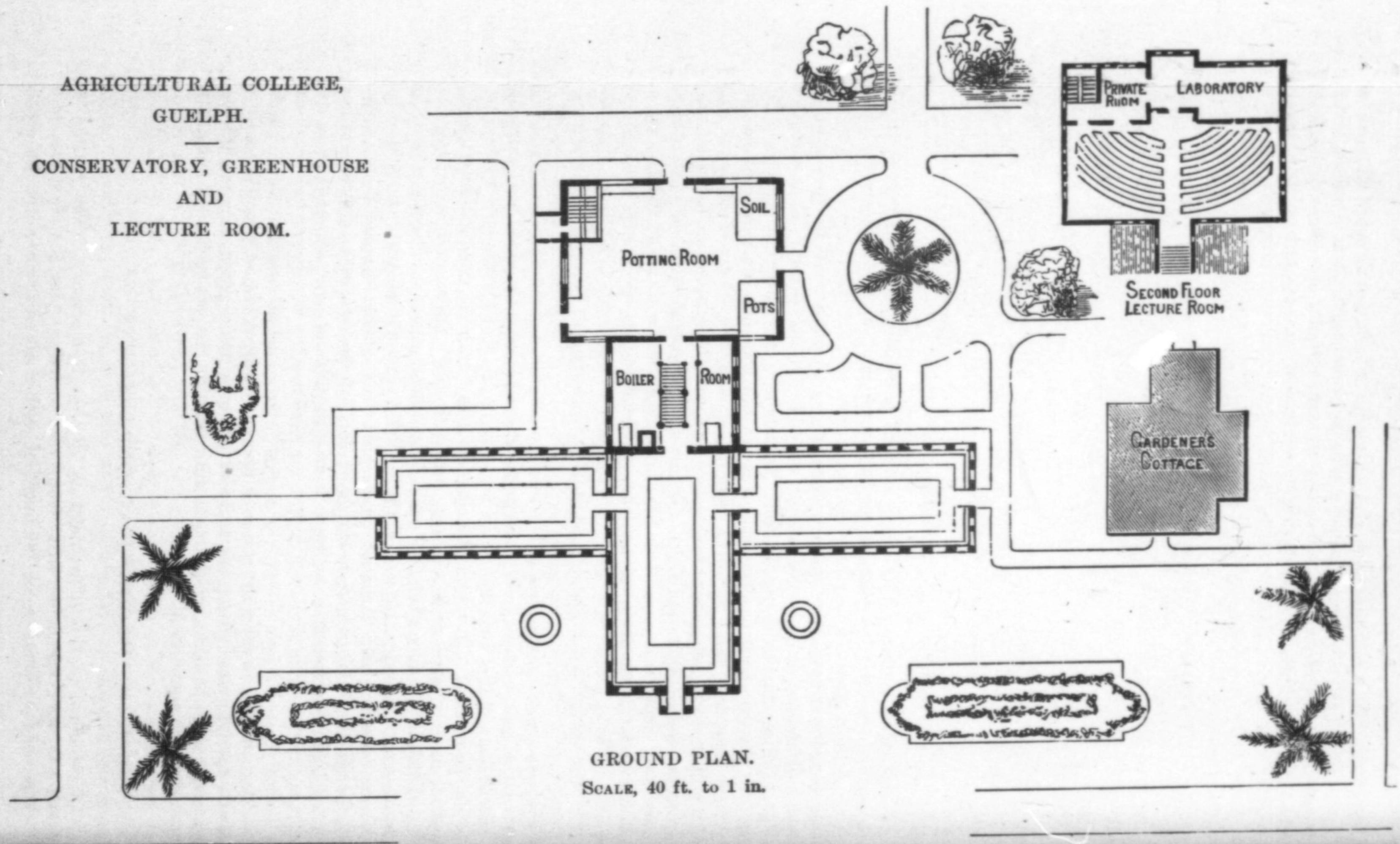
AGRICULTURAL COLLEGE, GUELPH.—PERSPECTIVE VIEW OF CONSERVATORY, GREENHOUSE AND LECTURE-ROOM.

AGRICULTURAL COLLEGE,
GUELPH.

AGRICULTURAL COLLEGE, GUELPH.—PERSPECTIVE VIEW OF CONSERVATORY, GREENHOUSE AND LECTURE-ROOM.

AGRICULTURAL COLLEGE,
GUELPH.

CONSERVATORY, GREENHOUSE
AND
LECTURE ROOM.



GROUND PLAN.
Scale, 40 ft. to 1 in.

1. Main Building. 14. Cottage for Farmer. AGRICULTURAL COLLEGE, A. Anacardiaceæ ..Sumach. B. Aquifoliaceæ...Holly. T. Malvaceæ ...Mallow. U. Myricaceæ ..Sweet Gale.

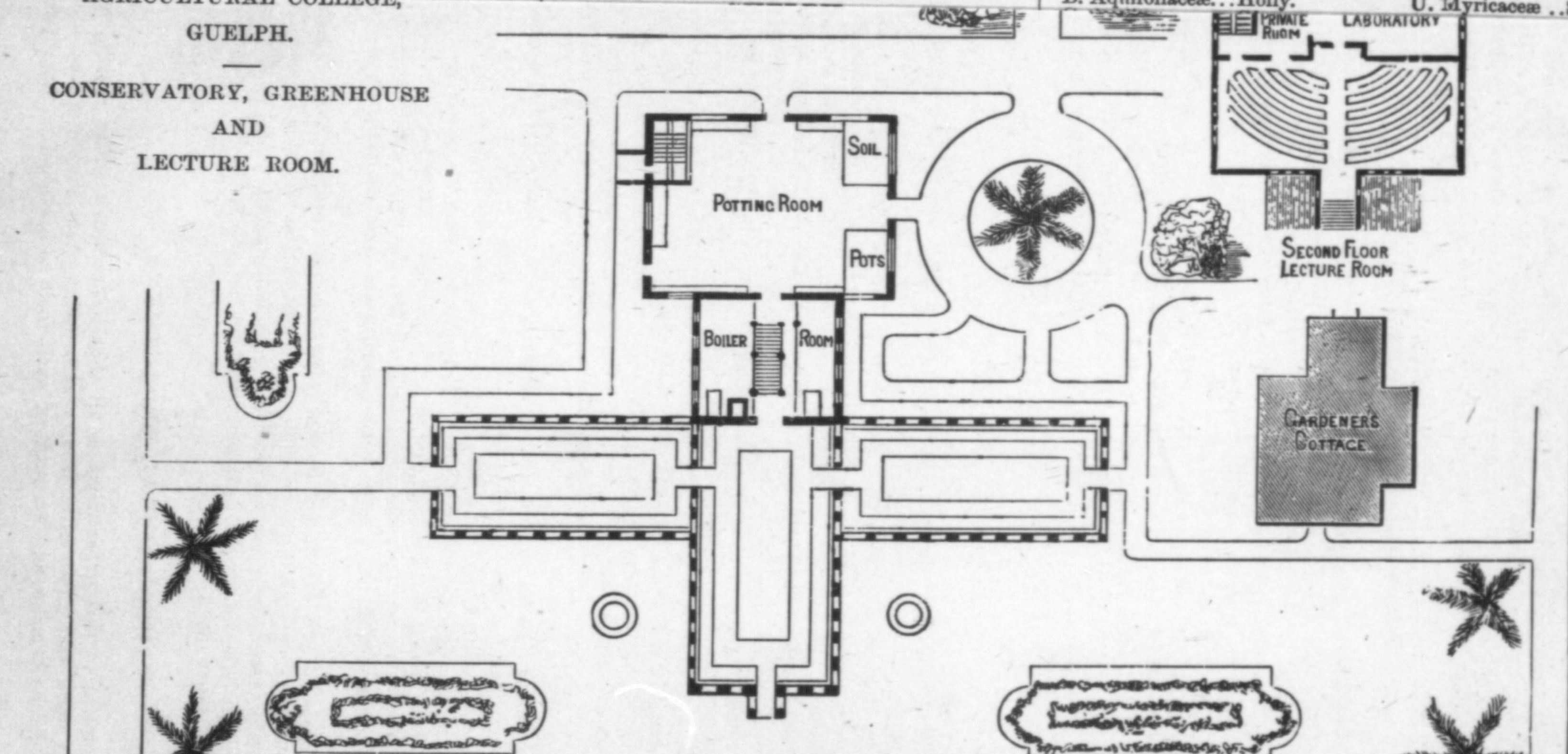
AGRICULTURAL COLLEGE,

GUELPH.

CONSERVATORY, GREENHOUSE

AND

LECTURE ROOM.



GROUND PLAN.

SCALE, 40 ft. to 1 in.

The second year men read Shakespere's "Julius Cæsar," and a part of "King Richard the Second;" and spent two hours a week on the important subject of Political Economy. Land, Labour, and Capital passed under review; and solutions for some of the problems connected with Protection, Free Trade, the Functions of Government, &c., were proposed and discussed.

Mathematics and Book-keeping.

The work under this head presents several difficulties. We cannot devote much time to it; and most of our students have a very imperfect knowledge of the elementary principles of Mathematics when they come to us. Consequently, we have not as yet undertaken anything beyond Arithmetic, Mensuration, elementary Mechanics, and the less difficult operations in Levelling and Surveying. Even in these few branches, we find it necessary to lay most stress on what is likely to have frequent application in the ordinary business of a farming community. The Book-Keeping also is of a special kind. It might be called farm Book-Keeping; farm, garden, field, and dairy accounts.

The work of last winter differed very little from that of the winter before; hence I shall not spend time in describing it, but simply refer to the examination papers on Arithmetic, Statics, and Book-keeping in Appendix 3, and the Class Lists in Appendix 4, for evidence of the work done in this department.

LAWN AND GARDEN.

When the College was first opened, I presume the country would not support the Government of the day in voting the money necessary to lay out and grade the grounds properly in front of the College buildings. At any rate the work was not done. Roads were made and trees planted, it is true; but the well defined ridges and furrows of the ploughed field remained. It was felt all along that something should be done to put the grounds in proper shape, before the trees would grow so large that they could not be transplanted. No action, however, was taken till last spring, when the officers representing the Fruit Growers of Ontario succeeded in getting authority to employ Mr. Miller, the well-known landscape gardener, of Fairmount Park, Philadelphia, to lay out the grounds, fix the sites for new buildings, and draw plans for new Green-houses and a Botanical Laboratory. The ground was measured and plans drawn during the summer. The work of transplanting, grading, and making new roads was begun by Mr. Miller's foreman in the month of September, and has already progressed so far as to convince even the most conservative that the improvement will be very great. For fuller information, see Report of Fruit Growers, in the Fourth Part of this volume.

The Fruit Growers' Association has also made large additions to our fruit and ornamental trees during the last two years; and J Playfair McMurrich, M.A., an accomplished graduate of Toronto University, has lately been appointed Professor of Biology and Horticulture. Consequently we have been able to give the students, not only exercise in practical gardening under Mr. Forsyth, as formerly, but also lectures on Horticulture by Professor McMurrich. So that the opportunities for theoretical and practical instruction in this department have been better during the past year than at any time previous.

In the early part of last winter, the second year students were sent to the gardener for instruction in grafting, budding, layering, etc.; about the middle of February, they commenced a special examination and study of our greenhouse plants; and at the end of March, most of them passed a creditable examination on the paper, headed Horticulture, in the first part of Appendix 3.

MECHANICAL DEPARTMENT.

A brief reference to this department is all that is necessary. The routine is unchanged, and the work varies but little from year to year. Our shop is a very homely one, with three or four benches and an outfit of such tools as are required for repairing and general carpenter work. The students are sent to this department, as to all others, in rotation. They are first taught the use of the different tools, and afterwards employed in doing a variety of work, such as is constantly needed on the farm—making gates, waggon-tongues, whiffle-trees, etc.; and repairing fences, barns, and College buildings.

SPECIAL STUDENTS.

For the last four or five years we have had a Special Class for the convenience of farmers' sons, who have come to the College during the winter months and have returned home about the first of April, in time for the spring work on their own farms. Such students, by omitting the manual labour outside, have been able to take, in two terms, all the lectures that regular students have got in three terms. The following statement will explain what I mean:—

Regular Students.

Fall Term.—1st October to 22nd December,
Winter Term.—5th January to 31st March,
Spring Term.—16th April to 30th June.
} Lectures half day and manual labour half day alternately.

Summer Term.—1st July to 31st August—Manual labour on Experimental Farm

Special Students.

Fall Term.—1st October to 31st December,
Winter Term.—5th January to 31st March.
} Lectures six hours a day.

Spring Term.—16th April to 30th June,
Summer Term.—1st July to 31st August.
} Work at home on their own farms.

Last year we had ten in this class—six first and four second year men. They attended lectures one-half of the day with the regular students of their own year; and the other half, when the regulars were employed outside, they (the specials) had lectures by themselves on the work of the Spring Term. Thus, by omitting the labour outside and giving the professors extra work inside, they were enabled, during the Fall and Winter Terms, to take not only the lectures of those terms, but also the lectures of the Spring Term as well.

I have only to add that this class has not been well patronized. Of the ten who entered it last October, only seven remained in it till the Easter Examinations. Hence the professors had to lecture to a very small number—so small that I have abolished the class altogether, and have organized in its stead a Special Class for the study of Live Stock and Veterinary Science.

EASTER EXAMINATIONS.

The Easter Examinations were, as usual, on the class-room work of the Winter Session (1st October to the 1st April). They commenced on the 18th, and ended on the 29th of March. The questions set in the different subjects will be found in the first part of Appendix 3. Most of them are difficult enough to differentiate the best students, while they give every honest worker a fair chance to pass. The answers were carefully valued, and the candidates arranged in three classes, according to the per centage of marks obtained by each.

All below 33 per cent	"plucked."
33 per cent. to 49 per cent., inclusive	3rd class or passed.
50 " 74 " "	2nd class honours.
75 " 100 " "	1st class honours.

A complete record of all the candidates will be found in the Class-Lists (Appendix 4); not only those who passed or won honours, but also those who failed. A fair proportion got first-class honours in one or more subjects, and a few gained the high rank of first-class men in one or more of the five departments.

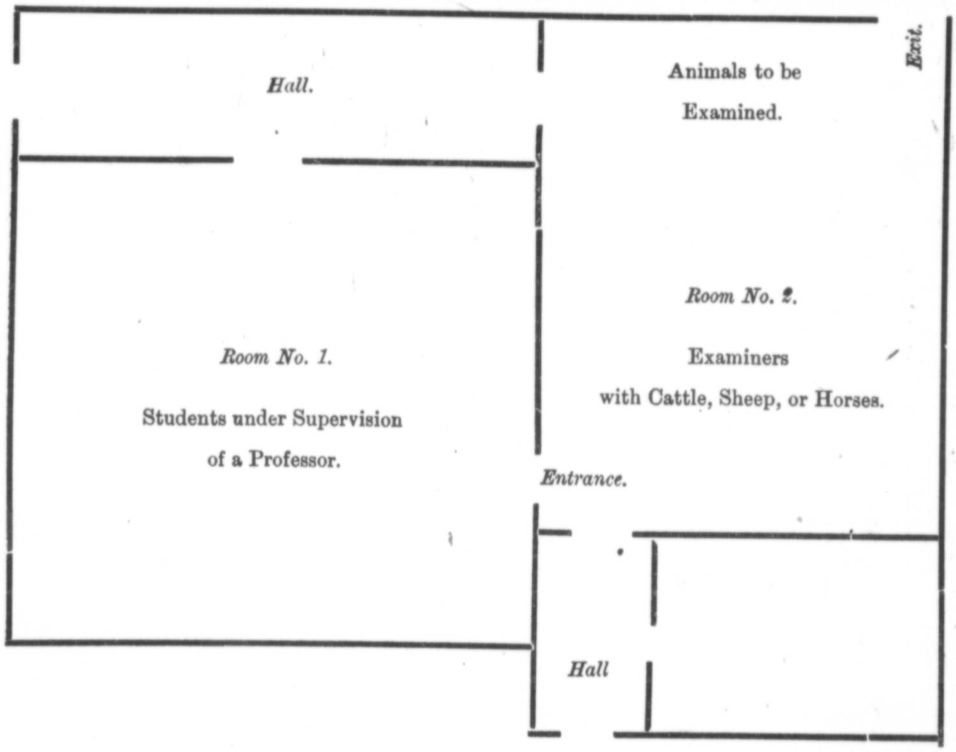
First-Class Men in the Departments at Easter.

Departments.		First Year.	Departments.		Second Year.
I.	Agriculture and Live Stock.	1. McKercher, W.	I.	Agriculture and Live Stock.	1. Howitt, W. 2. Wellington, F. 3. Shuttleworth, A.
II.	Natural Science.	1. Hutton, J. R. 2. Hopkins, J. A.	II.	Natural Science.	1. Howitt, W,
III.	Veterinary Science.	1. McKercher, W 2. Thomas, F. J. 3. Hutton, J. R. 4. Raikes, H. 5. Ord, W. 6. Lough, W. H.	III.	Veterinary Science.	1. Howitt, W. 2. Wettlaufer, F. 3. Ramsay, R. A. 4. Shuttleworth, A. 5. Blanchard, M. G.
IV.	Eng. Lit. and Political Economy	1. Fotheringham, W. 2. Hutton, J. R.	IV.	Eng. Lit. and Political Economy	1. Howitt, W.
V.	Mathematics.	1. { McKercher, W. { Bowes, J. C. 3. Hutton, J. R. 4. { Hopkins, J. A. { Minard, W. F. 6. Clark, F. 7. { Willis, W. B. { McPherson, D. 9. Robertson, W. 10. Stevenson, C. R.	V.	Mathematics.	1. Howitt, W. 2. Wettlaufer, F.

Oral Examination on Live Stock.

In my last report I called your attention to the fact that we had instituted a practical examination of cattle, sheep, and horses, to be held twice a year—at Easter and Midsummer. We did so because we had discovered that it was quite possible for a young man to study books and copy notes of lectures, till he could write very sensible answers to questions on any class of animals, and, after all, be utterly unable to describe or judge intelligently any particular specimen, according to the standard which he found in his books or notes. The result has been all that we could have wished. The anticipation of these half-yearly examinations has led the students to go more frequently into the yards and stables, with note books in hand, to handle, judge, and compare various specimens of the several breeds of animals kept by the Institution.

In speaking more particularly of last Easter, I may say that the animals to be examined were taken into the Veterinary Class-room. The students were admitted, one at a time; and when each had spent the allotted number of minutes in examining the animals and answering questions, he passed out, and another from an adjoining class-room took his place. The following diagram shows the relative position of the rooms used, and indicates more clearly than words how the examination was conducted :—



The class to be examined each day was sent early in the morning to room No. 1 in charge of a Professor; and at the hour for commencing the examination, the first student on the list went from room No. 1 to room No. 2, to meet the examiners. When his time was up, he passed out of the building. Another from No. 1 took his place; and so on, till the whole list was gone through.

PRIZE LIST.

Easter Examinations, March, 1882.

FIRST YEAR.

Agriculture and Live Stock—
1st. McKercher, W.

Natural Science—
1st. Hutton, J. R.
2nd. Hopkins, J. A.

Veterinary Science—
1st. McKercher, W.
2nd. Thomas, F. J.

English Literature & Composition—
1st. Fotheringham, W.
2nd. Hutton, J. R.

Mathematics—
1st. { McKercher, W.
Bowes, J. C.
2nd. Hutton, J. R.

General Proficiency—
1st. Hutton, J. R.
2nd. McKercher, W.
3rd. { Hopkins, J. A.
Thomas, F. J.

SECOND YEAR.

Agriculture and Live Stock—
1st. Howitt, W.
2nd. Wettlaufer, F.

Natural Science—
1st. Howitt, W.

Veterinary Science—
1st. Howitt, W.
2nd. Wettlaufer, F.

English Lit. and Pol. Economy—
1st. Howitt, W.

Mathematics—
1st. Howitt, W.
2nd. Wettlaufer, F.

General Proficiency—
1st. Howitt, W.
2nd. Wettlaufer, F.
3rd. Shuttleworth, A.
4th. Ramsay, R. A.

HONOR CERTIFICATES.

FIRST YEAR.

Agriculture and Live Stock—

1. McKercher, W .... Wroxeter (Huron), Ont.

Natural Science—

1. Hutton, J. R .... St. Catharines (Welland), Ont.
2. Hopkins, J. A.................. Holt (York), Ont.

Vetrinary Science—

1. McKercher, W .... Wroxeter (Huron), Ont.
2. Thomas, F. J .... Oxford, England.
3. Hutton, J. R .... St. Catharines (Welland), Ont.
4. Raikes, H .... Barrie (Simcoe), Ont.
5. Ord, W .... Toronto.
6. Lough, W. H .... Clinton (Huron), Ont.

English Literature and Composition—

1. Fotheringham, W .... St. Marys (Perth), Ont.
2. Hutton, J. R .... St. Catharines (Welland), Ont.

Mathematics—

1. McKercher, W .... Wroxeter (Huron), Ont.
   Bowes, J. C .... Halifax, Nova Scotia, (equal).
3. Hutton, J. R .... St. Catharines (Welland), Ont.
4. Hopkins, J. A .... Holt (York), Ont.
   Minard, W. F .... St. Thomas (Elgin), Ont. (equal).
6. Clark, F .... Parkdale (York), Ont.
7. Willis, W. B .... Whitby (Ontario), Ont.
   McPherson, D .... Glanworth (Middlesex), Ont., (equal).
9. Robertson, W .... Wanstead (Lambton), Ont.
10. Stevenson, C. R .... Fingal (Elgin), Ont.

SECOND YEAR.

Agriculture and Live Stock—

1. Howitt, W .... Guelph (Wellington), Ont.
2. Wettlaufer, F .... Tavistock (Oxford), Ont.
3. Shuttleworth, A .... Mt. Albert (York), Ont.

Natural Science—

1. Howitt, W .... Guelph (Wellington), Ont.

Veterinary Science—

1. Howitt, W. .... Guelph (Wellington), Ont.
2. Wettlaufer, F. .... Tavistock (Oxford), Ont.
3. Ramsay, R. A. .... Eden Mills (Halton), Ont.
4. Shuttleworth, A. .... Mount Albert (York), Ont.
5. Blanchard, M. G .... Windsor, Nova Scotia.

English Literature and Political Economy—

1. Howitt, W. .... Guelp (Wellington), Ont.

Mathematics—

1. Howitt, W. .... Guelph (Wellington), Ont.
2. Wettlaufer, F. .... Tavistock, (Oxford), Ont.

SPRING TERM.

(16th April, to 30th June.)

All specialists and generally some others leave at Easter; hence we have been accustomed to hold two entrance examinations in the year, one on the 1st of October, and another on the 16th of April. The number admitted last April was 27. They were examined on the 17th and 18th; and lectures commenced on the 19th.

As the Spring Term affords special opportunities for practice in the outside departments, the class-room work did not receive quite so much attention as during the Winter Term. Every one had to attend lectures three hours a day as usual; but a little less time was occupied in study than during the winter months. From four and a half to five hours a day were devoted to practical work outside, a part of which was spent with the instructor, and the balance with the foremen of the several departments. By the instructor, I mean one of our men who spends most of his t me in teaching the students how to perform such operations as they require to understand before taking charge of erm on their own responsibility; such as harnessing and driving horses, plough ng, owi harrowing, rolling, mowing with scythe, driving a mower, and such like. The young men are sent to him in rotation, according to our knowledge of what they require an while under his instruction they get no wages. Hence they are generally anxious to learn as quickly as possible, so that they may be in a position to claim the promised pay for their work.

While particular prominence was given to practical work outside, the theoretical work inside was by no means neglected. In the department of Agriculture the cultivation of the various crops was taken up; seeds were examined and judged; the different modes of sowing discussed and exemplied; the principles of underlying rotation, and the rotations suitable to different soils, climates, and circumstances were explained; also the improvement of land by ordinary cultivation, subsoiling, fallowing, manuring, and laying down to grass. At the same time, under the head of Practical and Analytical Chemistry, the second year men were employed from three to four hours a week in the laboratory, examining and testing waters, soils, foods, manures, and samples of farm produce so far as our limited appliances would allow. In that way they were led to see the practical value of what they had already learned in Inorganic, Organic, and Agricultural Chemistry. They had opportunities for putting their knowledge to a practical test. Hence most of them entered cheerfully and heartily into the work. In Systematic and Economic Botany they received lectures on the general classification of plants, and studied more particularly those orders which contain the most important agricultural and economic plants—cereals, grasses, roots, and plants used in the manufacture of fabrics, oils, medicines, and other articles of commerce. At the same time the first year students were attending lectures on Geology and Botany. In the former they learned something of the formation, composition, and character of the soils found in the country; in the latter, they studied the plant in relation to the soil and the atmosphere—its form, food, functions, and diseases, giving special attention to hybridization, the different modes of propagation, and such diseases as smut, rust, mildew, etc. The lectures of the class-room were illustrated and applied to some extent by the gardener while the students were at work with him in the green-houses, gardens, and lawns. In the departments of Veterinary Science, English and Mathematics, the work was carried on as during the Winter Term. The first-year students had twenty-four lectures on the preparation, action and doses of about fifty kinds of medicine commonly used in veterinary practice; studied Sir Walter Scott's "Marmion"; wrote impromtu compositions; began the study of Mensuration; and continued that of Book-keeping from the previous term. During the same time, the second-year men had lectures on twenty-five or thirty additional medicines and the therapeutics of the veterinary art; read critically, and committed to memory Milton's "L'Allegro" and "Il Penseroso;" gave some attention to farm Book-keeping; and went twice a week into the fields with a master to apply what had previously been taught under the heads of Levelling, Surveying, and Drainage.

The term closed with a seven days' written examination on the class-room work, and a practical examination on various operations in the outside departments.

EXAMINERS AND EXAMINATIONS.

Hitherto we have found much difficulty in getting suitable persons to act as examiners in Agriculture and Live Stock. Many have the knowledge, but few the experience necessary for that kind of work; some have both the knowledge and the experience, but can not spare the time. In order, therefore, to make our honours and dipolmas worth as much as possible to the recepients, I think it would be advisable, before long, to ask for a small annual vote, to pay examiners in all the departments; we should then find less difficulty in getting competent men to undertake the work; the students would not confine themselves so closely to the lecture-room notes—they would read more intensively; and, I have no doubt, it would have an excellent effect on both professors and students.

Last Easter, the examinations were all conducted by the professors of the College, except Practical Cattle, Practical Sheep, and English Literature; and at midsummer, the only subjects in which we had outside examiners, were English Literature and the Practical Handling and Judging of Horses. For cattle and sheep, we had the well-known prize-farm judges, John Hobson, Esq., of the County of Wellington, and Charles Drury, M.P.P., Crown Hill, Simcoe; for horses, we had the highest veterinary authority in the country, Dr. Smith, of the Veterinary College, Toronto; and in English literature, we secured the very efficient services of William Tytler, B.A., Guelph High School, and S. C. Smoke, B.A., of Paris, Ontario.

These gentlemen prepared questions and examined the answers at considerable sacrifice. Some of them, I know, did so under severe pressure of other duties. Hence it seems very inadequate remuneration, merely to thank them on my own behalf and in the name of the Institution which I have the honour to represent.

The results of the Midsummer Examinations are give fully in the second part of Appendix 4; from which it will be seen that a few in each year gained the rank of first-class men in one or more of the departments, and received honour certificates as follows:—

HONOUR CERTIFICATES.

Midsummer Examinations.

FIRST YEAR.

Agricultural—

1. { Hutton, J. R. .... St. Catharines (Welland), Ont.
   { Jeffs, H. B. .... Bond Head (Simcoe), Ont.
3. Creelman, J. A. .... Collingwood (Grey), Ont.

Natural Science—

1. Hutton, J. R. .... St. Catharines (Welland), Ont.
2. Slater, H. .... Somerset, England.
3. Gregory, J. .... Fredericton, New Brunswick.

Veterinary Materia Medica—

1.	Robertson, W.	Wanstead (Lambton), Ont.
	Jeffs, H. B	Bond Head (Simcoe), Ont.
3.	McNish, C. H.	Lyn (Leeds), Ont.
	Saxon, E. A.	Cheshire, England.
4.	Slater, H.	Somerset, England.
	Neilson, J.	Lyn (Leeds), Ont.
7.	Maunsell, G. S.	Ottawa.
	Homfray, P.	Birmingham, England.
9.	Tucker,	Toronto.
	Hutton, J. R.	St. Catharines (Welland), Ont.
	Willis, W. B.	Whitby (Ontario), Ont.
12.	Smith, J. L.	Ottawa.
	Fotheringham	St. Mary's (Perth), Ont.
13.	McPherson, D.	Glanworth (Middlesex), Ont.

English Literature and Composition—

1.	Hutton, J. R.	St. Catharines (Welland), Ont.
2.	Slater, H.	Somerset, England.
3.	Willis, W. B	Whitby (Ontario), Ont.

Mathematics—

1.	Slater, H.	Somerset, England.

SECOND YEAR.

Agriculture and Live Stock—

1.	Shuttleworth, A.	Mount Albert (York), Ont.
2.	Wettlaufer, F.	Tavistock (Oxford), Ont.
3,	Ramsay, R. A.	Eden Mills (Halton), Ont.
4.	Chase, O.	Cornwallis, Nova Scotia.

Natural Science—

1.	Wettlaufer, F.	Tavistock (Oxford), Ont.

Veterinary Science—

1.	Wettlaufer, F.	Tavistock (Oxford), Ont.
2.	Ramsay, R. A.	Eden Mills (Halton), Ont.

English Literature—

1.	Thomas, F. J	Oxford, England.
2.	Wettlaufer, F.	Tavistock (Oxford), Ont.

Mathematics and Book-Keeping—

1.	Chase, O.	Cornwallis, Nova Scotia.
2.	Shuttleworth, A.	Mount Albert (York), Ont.
3.	Wettlaufer, F.	Tavistock (Oxford), Ont.

MEDALS.

Last year I had the pleasure of announcing for the first time, the fact, that you had decided to offer three medals for competition among the second year students of this Institution. The announcement was received with great applause, and all felt gratified that the Commissioner of Agriculture had taken another step in advance. A handsome design was prepared by Mr. G. E. Thomas, our late Bursar; and the medals were struck in time for presentation on the 30th June.

The medals are designated—

THE GOLD MEDAL,
THE FIRST SILVER MEDAL,
THE SECOND SILVER MEDAL;

and the terms of competition are as follows:—

All second year students are eligible to compete, provided they continue regularly from the beginning to the end of the course, without dropping out, or missing any of the prescribed examinations.

In case of failures in first year examinations, or the Christmas examinations of the second year, the President may grant supplemental examinations, or entertain claims for an *ægrotat*, without interfering with the right to compete.

The competition is :—

(1) By written examinations at Easter on the class-room work of the Fall and Winter Terms.

(2) By written examinations at the end of June on the class-room work of the Spring Term.

(3) By practical examinations at the above dates on cattle, sheep, pigs, horses, and the various operations taught or performed on the farm, in the garden, or in the carpenter shop.

The minimum standard for the gold medal is 50 per cent. of the marks in each subject, and an aggregate of 75 per cent. of the total number of marks in all the subjects ; for the silver medals, 50 per cent. in each subject and an aggregate of 67 per cent. in all the subjects.

The first competition for these medals was somewhat keen, as might be expected ; and there was one or two circumstances connected with it, which it is proper that I should mention for the purpose of doing justice to all concerned.

Mr. Wm. Howitt, of the County of Wellington, was a member of the class that graduated in 1881 ; but, on account of sickness at home, he had to drop out before the end of the year. When he returned to complete his course with the class of 1882, the question of his right to compete for a medal was at once raised. After reference to yourself, it was decided that Mr. Howitt might compete, provided he came back only for the time and lectures which he had lost the year before ; and on these conditions he entered the class of 1882. At the Easter examinations he headed the list in every department ; and it was generally admitted, that, although the other competitors were first-class men, there was nothing to prevent Mr. Howitt from taking the Gold Medal in June. Some, however, persisted in saying that the competition was unfair, that he had an advantage over the rest, that he should not be allowed to compete, &c., &c. Neither the Commissioner of Agriculture, nor the Faculty of the College admitted the correctness of these statements ; but rather than have any such feeling exist, Mr. Howitt voluntarily and magnanimously withdrew from the competition altogether.

The record of the other competitors was very creditable ; and the examiners felt, that in awarding medals to the first three on the list, they were in no way endangering the reputation of the College. The relative standing of the first four or five was as follows :—

(1) Written Examinations at Easter.	(2) Written Examinat'ns, Midsummer.	(3) Practical Examinations, Midsummer.
1. Howitt, W., County of Wellington.	1. Wettlaufer, F.	1. Wettlaufer, F.
2. Wettlaufer, F., County of Oxford.	2. Shuttleworth, A.	2. Shuttleworth, A.
3. Shuttleworth, A., County of York.	3. Ramsay, R. A.	3. Ramsay, R. A.
4. Ramsay, R. A., County of Halton.	4. Chase, O.	4. Chase, O.
5. Stover, J. W., County of Oxford.		

General Proficiency.

1. Wettlaufer, F., Tavistock (Oxford), Ont.—Gold Medallist
2. Shuttleworth, A., Mount Albert (York), Ont.—First Silver Medallist.
3. Ramsay, R. A., Eden Mills (Halton), Ont.—Second Silver Medallist.

Five medals have already been awarded, four of which have gone to Ontario, and one to Nova Scotia. The winners have all been non-drinkers and non-smokers, and all but one farmers' sons—

J. L. Webster, Nova Scotia	1880.
R. J. Phin, County of Waterloo, Ont.	1881.
F. Wettlaufer, County of Oxford, Ont.	1882.
A. Shuttleworth, County of York, Ont.	"
R. A. Ramsay, County of Halton, Ont.	"

CLOSING EXERCISES.

Presentation of Medals and Prizes; Granting of Diplomas.

The closing exercises of the College took place on the 30th of June, which happened to be a very wet day. The rain poured down the greater part of the afternoon; but, notwithstanding, there was a very fair attendance of visitors from town and country to see the young men receive their diplomas, prizes, and honour certificates. In the absence of the Commissioner of Agriculture, the President of the College performed the ceremony of granting the diplomas; the members of the Faculty presented the prizes; and a number of visitors took part in distributing the honour certificates. The Gold Medal was presented by Professor George Buckland, of Toronto University; the First Silver Medal, by James Innes, M.P., of Guelph; and the Second Silver Medal, by James Laidlaw, M.P.P., of South Wellington.

Out of twenty-six candidates for diplomas, fourteen were successful. To this number were added three who had failed the year before, and two who should have received their diplomas in 1880, making in all a class of ninteen who were admitted to the status of "Associates of the Ontario Agricultural College."

Associates of the College.

1881.

Ballantyne, W. W	Stratford, Ont.
Dickinson, C. S.	England.
Grindley, A. W	Montreal.
Motherwell, W. R	County of Lanark,
Phin, R. J.	Hespeler, County of Waterloo.
Phin, W. E	" "
Pope, Herbert	County of Grey, Ont.
Ross, James G.	Montreal.
Robins, W. P	"

1882.

Blanchard, M. G	Windsor, Nova Scotia.
Charlton, G. H.	St. George (Brant), Ont.
Chase, Oscar.	Cornwallis, Nova Scotia.
Dawson, J. J	South Zorra (Oxford), Ont.
Dennis, James	Weston (York), Ont.
Elworthy, R. H	Jamaica.
Fotheringham, James	St. Mary's (Perth), Ont.

Hallesy, Frederick .... Merthyr Tydvil, Wales.
Horne, W. H .... North Keppel (Grey), Ont.
Howitt, Wm .... Guelph (Wellington), Ont.
Landsborough, John .... Clinton (Huron), Ont.
Mahony, E. C .... Hamilton (Wentworth), Ont.
Nicol, George .... Cataraqui (Frontenac), Ont.
Ramsay, R. A .... Eden Mills (Halton), Ont.
Shuttleworth, Arthur .... Mt. Albert (York), Ont.
Silverthorne, Newman .... Sommerville (Peel), Ont.
Stover, J. W .... Norwich (Oxford), Ont.
Wettlaufer, Frederick .... Tavistock (Oxford), Ont.
White, C. D .... Hereford, England.

N.B.—In all the above lists, the county in which the student resides is given, even when the post-office address is in another county.

SPECIAL DIPLOMAS FOR STUDENTS WHO COMPLETED THE COURSE OF STUDY PRIOR TO FEBRUARY, 1880.

In the circular issued by the ex-President Mr. Johnston in 1877 and thereafter, it was stated that diplomas would be given to all students who should complete the course of study and pass satisfactorily all the prescribed examinations. But the college was not chartered till 1880; and therefore it was impossible for the President to fulfil the promises made in 1877, '78 and '79. In the fall of 1879, a change in the presidency took place; and the new President did not feel justified in taking any action in the matter, without special instructions from the Government. At length, however, the case was laid before the Honourable the Commissioner of Agriculture; and, after due consideration, he decided that diplomas should be granted to all ex-students whom the ex-President, Wm. Johnston, Esq., M.A., would recommend as having completed the work and fulfilled all the conditions laid down in the College Circular during the time of his incumbency. The following is Mr. Johnston's report, made on the 12th day of August, 1882, and approved by the Commissioner of Agriculture on the 31st of the same month :—

ONTARIO AGRICULTURAL COLLEGE.

GUELPH, *12th August, 1882.*

To the HON. S. C. WOOD,

Commissioner of Agriculture :

The Ontario Agricultural College and Experimental Farm was incorporated by Chap. 33 of 43 Vic., Ont. Previous to that the institution had no legal status, and no power to grant diplomas. A number of students had, however, completed satisfactorily the prescribed course of study during the four preceding years; and some of them have applied for diplomas. Upon due and careful consideration, it has been decided to grant the prayer of their petition, as I have been informed, and allow the Act of 1880, above referred to, to have a retrospective effect, so far as granting of diplomas is concerned.

As the institution, up to the period of incorporation, was under the charge of the undersigned, he has the honour, at the command of the Honourable the Commissioner of Agriculture, to report as follows, as to the students who, during the years referred to, had satisfactorily completed the prescribed course of study, and would, therefore, under the Act of Incorporation, be now eligible for diplomas :—

I.—SESSIONS OF 1875–76–77.

The institution opened on the 1st day of May, A.D. 1874, but, owing to various causes, no curriculum was issued until the 1st day of January, 1875. The complete course of study prescribed by that curriculum was, during the years of 1875, 1876 and 1877, completed satisfactorily by the following students, whom the undersigned has, therefore, the honour of recommending for diplomas :—

1. Andrew Charles O'Beirne.
2. John Andrew Campbell.
3. John Duncan Douglas.
4. Stevenson Dunlop.
5. Allan John Lindsay.
6. Thomas Henry Mason.
7. George William Meyer.
8. George Herbert Shaw.
9. William John Sykes.
10. Clarence Wells.

II.—Session of 1877–78.

The students who, at the close of this session, had satisfactorily completed the prescribed course of study, and under the existing Act, rendered themselves thereby eligible for the diplomas, for which the undersigned has now the honour of recommending them, are as follows :—

1. Edward Crompton.
2. Charles I. Davis.
3. William K. Farlinger.
4. David Graham.
5. Thomas Logan.
6. David Morrison Naismith.
7. William Stewart.
8. John B. Warren.

III.—Session of 1878–79.

The additions made to the college buildings during the summer of 1877, enabled the number of students to be greatly increased. Those who entered on the 1st day of October, 1877, were at the end of this session at the close of their two years of study. Of this number those who in August, 1878, had, by passing through this course satisfactorily, rendered themselves eligible to receive the diplomas, for which the undersigned has now the honour to recommend them, were as follows :—

1. Ernest Louis Bonnard.
2. James Clark.
3. Nelson James Clinton.
4. Alexander Fyfe.
5. George H. Gillespie.
6. George H. Greig.
7. William Jopling.
8. Arthur Nichol.
9. John R. Randall.
10. Charles B. Robinson.
11. John Robertson.
12. Lewis Toole.
13. Angus W. Warnica.
14. George P. White.
15. Peter J. Wilkinson.
16. John Willis.

IV.—Session of 1879–80.

The undersigned had closed his connection with the Institution before the end of this session, but all the students of this class had been entered by him, and had pursued their studies, during most of the time, under his charge. So far, therefore, as he is concerned, he has the honour to recommend that diplomas be granted in the class of this session, to the following :—

1. John Anderson.
2. George Edward Ash.
3. Donald Peter L. Campbell.
4. Richard K. Chapman.
5. Alexander Hume Clutton.
6. Mark. A. Dawes.
7. Richard F. Holterman.
8. Joseph Wellesley Lomas
9. Herbert Macaulay.
10. John Lindsay Webster.

Since the first day of January, 1875, there have been a few alterations in, and additions to, the curriculum, but the students above mentioned, have completed the course of study as it was respectively arranged at the date of their entrance and graduation.

Though, prior to incorporation, there were no oral or written examinations on the work and study required to be undergone during the course of apprenticeship, that course was passed through, and completed in a highly satisfactory manner, by each and all of the students whose names are recorded above.

The undersigned has, therefore, the honour of recommending that, upon due application to James Mills, Esq., M.A., the present President of the institution, diplomas be duly issued to the several ex-students of the Ontario Agricultural College, whose names are given in the preceding pages of this report.

All of which is respectfully submitted.

WM. JOHNSTON,
Ex-President of the Ontario Agricultural College.

VISITORS.

I believe I am correct in saying that the Ontario Agricultural College and Experimental Farm has a larger number of visitors, from home and abroad, than any other institution in the country—visitors of every class and calling, but especially farmers. The only agricultural college in the Province; the only institution in the British Dominions that has systematically attempted to combine study and manual labour; an institution that has been keenly criticised and soundly abused—all this has given us more or less notoriety, and has excited a curiosity to see and know exactly what we are doing.

Last year we had not only the usual number of daily visitors, but several large excursions of farmers in the month of June, from Niagara, Wentworth, Huron, Bruce, Grey, Simcoe, York, and Peel, with smaller companies from Wellington, Waterloo, and other places. Everything passed off pleasantly. Short addresses were delivered by leading excursionists, and resolutions passed at the close of each day's proceedings.

SUMMER TERM.

(1ST JULY TO 31ST AUGUST.)

At the close of the spring term (30th June), when the year's lectures were ended, most of the farmers' sons went home for haying and harvest, and some of the other students hired out with farmers for the summer months; so that only forty-one remained with us during the Summer Term (July and August). These worked nine and a half hours a day, giving more or less attention to all the departments, but spending the greater part of their time where it was most needed, *i.e.*, on the farm. I shall not weary you with a detailed account of the routine in each department, but simply say that the young men received more or less instruction in the fields, the yards, the gardens, and the shop. They spent a portion of their time in a special class for the purpose, learning how to dig, plough, harrow, sow, shear sheep, mow, cradle, drive a reaper, bind, shock, and such like; and did all there was to do in the summer months, on a four hundred acre grain and stock farm, and in the management of a large vegetable garden, flower garden, orchard, and lawn.

HARVEST HOME.

The term closed on the 26th August, with the annual athletic sports, and the harvest home procession. For several weeks previous, the young men occupied their evenings on the college campus in walking, running, jumping, putting the stone, and similiar exercises. The attendance of visitors at the games was large. The weather was favourable, and everything passed off pleasantly. After the games came the harvest home procession around the college grounds, and the presentation of the prizes by Mrs. Brown and James Innes, M.P. So ended the scholastic year 1881–'82.

FALL TERM.

COMMENCEMENT OF A NEW SCHOLASTIC YEAR.—1ST OCTOBER TO 22ND DECEMBER, 1882.

In October, 1881, I accepted more applications than I had room for; and they all came. The consequence was, the College was over-crowded, and some had to board out for a while. In October, 1882, I refused all after the exact number (130) had been accepted; and, strange to say, no less than eighteen of those for whom I kept rooms, failed to put in an appearance. The result is that only 112, instead of 130, have been in attendance for the last three months.

Sixty-two old students returned, and fifty new ones were admitted at the commencement of the term—twenty-two by passing an examination, and twenty-eight on presentation of certificates. Their names and post-office address will be found in the second part of Appendix 1; and the following lists show the counties, countries, and religious denominations which they represent:—

Counties, &c.	*Students.*	*Counties, &c.*	*Students.*
Brant	2	Ontario	1
Bruce	1	Ottawa	10
Cyprus	1	Oxford	1
Elgin	4	Ohio	1
England	16	Peel	1
Glengarry	3	Peterborough	2
Grey	2	Perth	6
Hamilton	1	Prince Edward	1
Huron	1	Prince Edward Island	1
Ireland	3	Quebec	2
Kent	1	Simcoe	8
Kingston	1	Scotland	3
Lambton	3	Toronto	6
Leeds	3	Turkey	1
Manitoba	1	Wales	1
Middlesex	1	Welland	1
Montreal	1	Wellington	2
New Brunswick	6	Wentworth	2
Nova Scotia	1	West Indies	1
Northumberland	1	York	1

Total number in attendance during Fall Term **112**
Number of Ontario counties represented **24**

RELIGIOUS DENOMINATIONS.

Episcopalians	47
Presbyterians	27
Methodist Church of Canada	16
Roman Catholics	6
Baptists	4
Methodist Episcopals	3
Primitive Methodists	2
Congregational	2
Plymouth Brethren	1
Lutherans	1
Unitarians	1
Universalists	1
Swedenborgians	1
Total	**112**

Age of Students.

The standard age for admission was recently changed from fifteen to sixteen years. The ages of those now in attendance range from fifteen to thirty, averaging $18\frac{1}{3}$, as indicated by the following table :—

18	at the	age	of	16	years.
27	"	"		17	"
28	"	"		18	"
15	"	"		19	"
13	"	"		20	"
4	"	"		21	"
4	"	"		22	"
1	"	"		24	"
1	"	"		26	"
1	"	"		30	"

Average age, $18\frac{1}{3}$ years.

The time tables in Appendix 2 indicate the subjects which are taken up in the Fall Term, and the number of hours allotted to each. Lectures commenced on Wednesday, the 4th of October, and continued without interruption till the 19th December.

The first-year students received three lectures a week on the characteristic points and peculiarities of the different breeds of cattle; had a full course of lectures with experiments on Chemical Physics and Inorganic Chemistry; devoted an hour and a half to Human Physiology; and spent some time in studying the Anatomy and Physiology of the Horse. Under the head of English and Mathematics, they read a portion of Scott's "Marmion," wrote compositions once a week, and reviewed certain portions of Arithmetic, with special reference to the requirements of farming in Canada.

The attention of the second-year men was directed to such subjects as stock-breeding, farm management, and the experimental plots—the selection of animals for beef; the housing, feeding, and fattening of the same; the comparative values of pasture and green fodder; results from the different kinds of seed, soil, and manures; and the previous season's experiments with wheat, oats, and grasses. They had one lecture a week on Meterorology, and a full course of Agricultural Chemistry—the composition of different plants in relation to the soils on which they grow; the preservation and renovation of soils, the chemical composition and value of different manures, the superphosphates, double silicates, and other substances which furnish plant food. They spent two hours a week at lectures on Veterinary Pathology, and one in handling and examining horses for spavin, ring-bone, splint, founder, and other diseases—all under the eye and direction of our veterinary surgeon, Dr. Grenside; they also read Shakespeare's "Julius Cæsar," and devoted some time to the study of applied Statics, Levelling, and Drainage.

Terminal Examinations, December, 1882.

The examinations commenced on the 19th and ended on the 21st December. The questions were not particularly difficult, as they were intended only to indicate who were making a right use of their time, and to prepare the candidates for a severer test at Easter. The results having been published in the daily papers, it is unnecessary to repeat them here. I may, however, give a fuller outline of the work covered by the examinations:—

OUTLINE OF CLASS-ROOM WORK.

Fall Term.

First Year.

Department 1.—Agriculture.

Breeding, rearing, and feeding of animals. Points to be considered in deciding what kind of animals to keep.

Horses.—Different breeds of horses, and leading characteristics of each; type of horse required for farm work; breeding, feeding, and general management.

Cattle.—History and characteristics of Shorthorns, Herefords, Polland Angus, Ayrshires, Jerseys, Devons, Galloways, etc.; grade cattle; milch cows—points of a good milch cow; breeding generally, cross-breeding, in-and-in breeding; pedigree.

Sheep.—Breeds of sheep generally considered; long-woolled sheep; medium-woolled sheep; short-woolled sheep; crosses between different breeds compared; texture, quality, quantity, and uses of different kinds of wool.

Swine.—Characteristics of various breeds; management of sows; stores; bacon-curing, etc.

Department 2.—Natural Science.

Chemical Physics.—Matter, accessory and essential properties of matter; attraction, various kinds of attraction—cohesion, adhesion, capillary, electrical and chemical; specific gravity; weights and measures; heat, measurement of heat, thermometers, pyrometers, specific and latent heat; sources, nature and laws of light; spectrum analysis.

Inorganic Chemistry.—Scope of subjects; elementary and compound substances; chemical affinity; symbols; nomenclature; combining proportions by weight and by volume; atomic theory; atomicity of the most important elements; oxygen and hydrogen; water—its nature, functions, decomposition, and impurities; nitrogen; the atmosphere—its composition, uses and impurities; ammonia—its sources and uses; nitric acid and its connection with plants; carbon; combustion; carbonic acid and its relation to the animal and the vegetable kingdom; sulphur and its compounds; manufacture and uses of sulphuric acid; phosphorus; phosphoric acid and its importance in agriculture; chlorine—its bleaching properties; bromine; iodine; silicon, etc.

Human Physiology.—Evidences of life; elementary tissues, connective tissues, adipose tissue, cartilage, bone; alimentary system, teeth, salivary glands, stomach (structure and functions of), intestines, liver and pancreas; foods, digestion of an ordinary meal, dieting; respiratory system; ventilation; excretory system; functions and structure of the kindneys and skin; clothing; bathing; nervous system, general working of the system, structure and working of the brain, eye, ear and other sense organs; locomotory system, structure and physiology of the muscles; walking; running; exercise; hygiene—draining, thirty-seven motive diseases, contamination of water, etc.

Department 3.—Veterinary Science.

Anatomy and Physiology of the horse, ox, sheep and pig; osseous system, muscular system, syndesmology, plantar system, and odontology.

Department 4.—English.

Composition.—Impromptu exercises once a week.

English Classics.—Critical study of Scott's "Marmion."

Department 5.—Mathematics.

Arithmetic.—Review of subject, with special reference to farm accounts; tables of weights and measures discussed; interest, discount, stocks and partnership.

Mental Arithmetic.—Calculations in simple rules, fractions and compound rules.

Second Year.

Department 1.—Agriculture.

Experimental Plots.—The results of last season's experiments with wheat, oats, barley, peas, grasses, clovers, roots, etc.; liability to disease; effects of various manures on different crops; growth of plants, etc.

Farm Management.—Detailed account of the treatment of each field, results from different kinds of seed and soil; effects of manure; harvesting, storing, and threshing of crops; fall ploughing; subsoiling, etc.

Stock-feeding.—Value of feeding materials; estimate for winter keep of live stock; housing, feeding, and fattening; points to be observed in selecting animals for fattening; feeding experiments; common diseases of animals; management of animals on pasture; value of green fodder. Dairy management and cheese-making.

Department 2.—Natural Science.

Meteorology.—Relation of meteorology to agriculture; composition and movements of the atmosphere; nature and manipulation of the barometer, its importance in forecasting the weather; temperature, description of the various instruments used in its measurement and how to use them; solar and terrestrial radiation; the influence of forests on climate; mists, fogs, clouds, rain, hail, and snow; description of instruments used in measuring rain and snow fall; velocity and direction of wind; causes affecting climate; influence of climate on vegetation.

Agricultural Chemistry.—Connection between chemistry and agriculture; the various compounds which enter into the composition of the bodies of animals; the chemical changes which food undergoes during digestion; chemical changes which occur during the decomposition of the bodies of animals at death; the functions of animals and plants contrasted; food of plants and whence derived; origin and nature of soils; classification of soils; causes of unproductiveness in soil and how detected; composition of different plants in relation to the soils upon which they grow; rotation of crops; preservation, development and renovation of soils; manures classified; the chemical action of manures on different soils; chemical theories in reference to the action of superphosphates; the action of lime in the decomposition of double silicates; feeding of animals; classification of foods; chemical results in the use of different foods; points necessary to be considered in order to obtain the full value of artificial and natural foods.

Department 3.—Veterinary Science.

Veterinary Pathology.—*Osseous System*—nature, causes, symptoms, and treatment of diseases of bone, as splint, spavin, ringbone, etc.

Muscular System—nature, causes, and treatment of flesh wounds, etc.

Syndesmology—nature, causes, symptoms, and treatment of bog spavin, curb, and other diseases of the joints.

Plantar System—nature, causes, symptoms, and treatment of corns, sand-crack, founder, and other diseases of the foot.

Odontology—diseases of the teeth and treatment of the same.

Department 4.—English Literature.

English Classics.—Critical study of Shakespeare's "Julius Cæsar."

English Composition.—Rules for capitals and punctuation; essay writing.

Department 5.—Mathematics.

Mental Arithmetic.—Calculations in reduction, fractions, and analysis.

Statics.—Forces; the mechanical powers; friction; the steam-engine; strength of materials; units of work, etc.

Levelling and Draining.—General principles; discharging water ways; how, where and when to commence draining; depth of drains and distance apart; furrow drains; draining followed by other improvements; draining implements, etc.

II.—THE BOARDING HOUSE AND COLLEGE BUILDINGS.

For the information of those who have not seen the College buildings, I shall quote a paragraph from my last report, and refer to the description given by the Government Architect in the 6th Appendix to this report:—

College Building.

The College building, as shown on frontispiece, is a plain substantial structure, without much claim to architectural beauty. Like the Institution itself, it was built little by little without any very definite idea of the shape it might ultimately assume. When the Government first bought land and determined to establish an Agricultural College, the Architect drew plans for a building which would have suited the purpose exactly, but the cost seemed too great and the country was not prepared for it, consequently it was decided eight years ago to commence work with a few students in Mr. Stone's farmhouse. Additions and alterations were made from time to time as the number of students increased, till the result is, the building which you see outlined and described by the Government Architect in Appendix 6—altogether different from what was originally intended; and though it is not what we would like, it nevertheless affords considerable accommodation, and serves the purpose very well.

In the building, as it now stands, there are one hundred and twenty-two rooms—three class-rooms, a reading-room, a library, a room to be fitted up for a museum, a laboratory, two offices, a public reception-room, sixty-two students' dormitories, a large dining-hall, a servants' dining-room, a store-room, pantry, kitchen, scullery, laundry, drying-room, eight bath-rooms, nine bed-rooms for servants, the messenger's room, a parlour and bed-room for the Matron, a sitting-room and bed-room for the Assistant Resident Master, nine rooms in the left wing occupied as a dwelling house by the Professor of Agriculture, six rooms in the centre occupied by the President and his family, three wash-rooms, an engine room and a coal-house. The size, position, and use of each room, can be better understood from an examination of the plans above referred to than from a verbal description. Hence I shall not attempt anything more elaborate under this head.

Cottages.

Four of the cottages asked for in my last report, have already been erected—two on the lawn and two in adjoining fields. A description of each by the Architect, will be found in Appendix 6. The general appearance and dimensions can be seen by referring to the plans and engravings on the following page.

Boarding House.

In the Boarding House nothing special has occurred during the past year. Things have moved along as usual. Our supplies are provided by contract; and, generally speaking, the quality of the articles furnished has been satisfactory. The Matron has superinrength of

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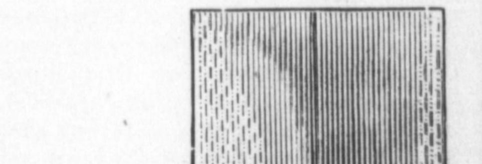
AGRICULTURAL COLLEGE, GUELPH

RESIDENCE FOR PROFESSOR.

PERSPECTIVE VIEW.

GROUND FLOOR PLAN.

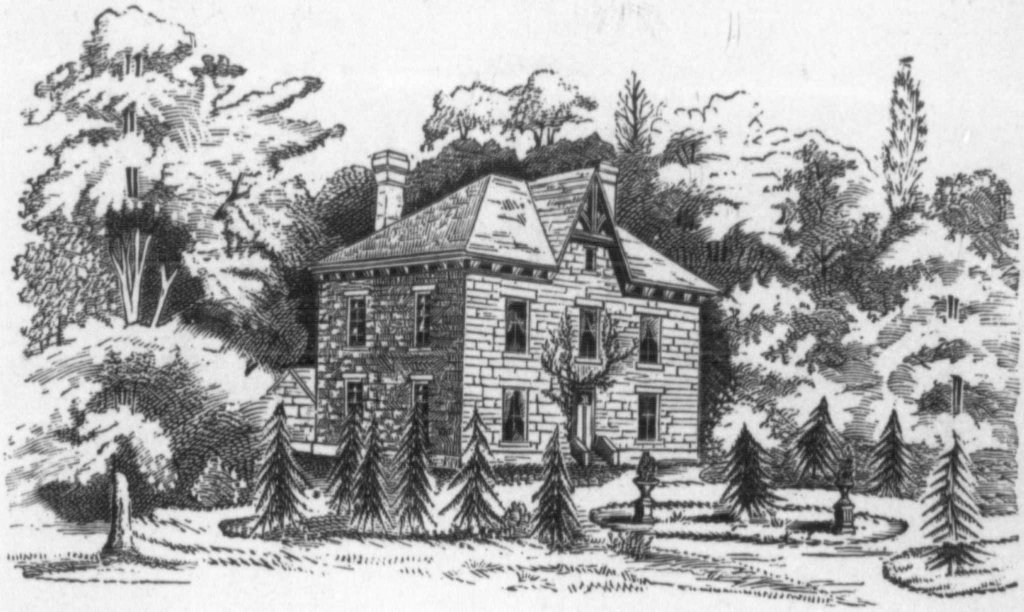


FIRST FLOOR PLAN.

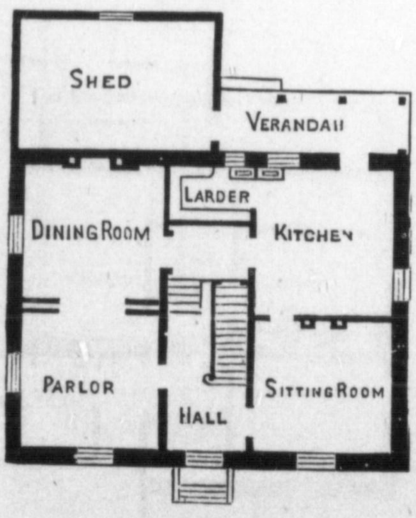
SCALE—20 feet to an inch.

AGRICULTURAL COLLEGE, GUELPH.

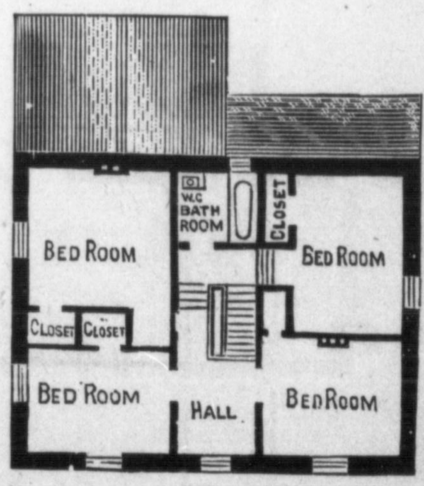
RESIDENCE FOR BURSAR.



PERSPECTIVE VIEW.



GROUND FLOOR PLAN.



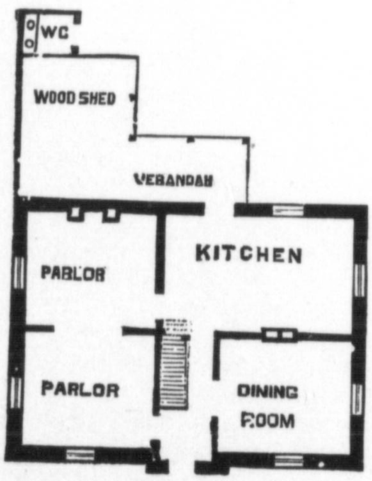
FIRST FLOOR PLAN.

SCALE—20 feet to an inch.

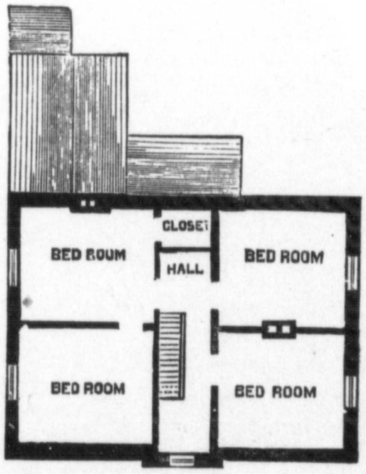
AGRICULTURAL COLLEGE, GUELPH.

COTTAGE FOR FARMER.

PERSPECTIVE VIEW.



GROUND FLOOR PLAN.



FIRST FLOOR PLAN.

SCALE—20 feet to 1 inch.

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tended the work in the culinary department, and the Assistant Resident Master has taken charge of the students at meals and assisted me in looking after them in the halls and dormitories.

Daily Routine.

In regard to the surroundings of our students in the College, and the duties required of them, I may say that their bed-rooms are furnished with beds, bedding, bureaus, mirrors, wash-stands, study-tables, and chairs. They sleep separately, two in a room, and in a few instances three. The daily routine during the Fall, Winter, and Spring Terms, is as follows:—

All are required to rise at six to make their beds and put their rooms in order. At half-past six they go to breakfast; and at seven the students of one division are sent to work outside, and those of the other employ their time as they feel disposed, till eight o'clock. From eight to nine the latter are at drill or gymnastics, and from nine to twelve at lectures in the class-room. Both divisions return to the boarding house, and prepare for dinner at half-past twelve. The bell rings at half-past one, and the division that was in at lectures in the forenoon, goes out to work in the afternoon. The other division is free till two o'clock. From two to five it attends lectures; and at five both divisions return again to the bording house to prepare for tea at half-past five. From tea time to seven o'clock, and in spring to eight o'clock, they generally rest or take exercise. From seven to nine in fall and winter, and from eight to half-past nine in spring, they study in their rooms under the supervision of a master. At nine or half-past nine, according to the season of the year, they proceed to roll-call and evening prayers; all lights are put out at ten, and doors closed at half-past ten. Every student who is not under ban for some misdemeanour, is allowed out one evening in the week, till half-past ten. To some parents, perhaps, this will appear late; but, as it takes not less than thirty minutes to come from the city to the College, any earlier hour would scarcely give sufficient time. When going out, each student leaves his name with the master in charge, and is required to report himself on his return, that we may know whether all are in or not before the doors are closed for the night.

Such is the routine in the boarding house, and such are the duties required of the students therein, during nine months of the year. As the months of July and August are devoted entirely to work in the outside departments, the duties inside differ but little from those of an ordinary boarding house on a large scale.

Discipline.

Where you have one hundred and twenty or thirty young men full of animal spirits boarding and lodging in the same building, it is by no means easy to maintain proper discipline. It is indeed a very difficult task, and one which imposes on those who are responsible, a load of care and anxiety from which there is no escape night or day. It requires kindness, firmness, tact, constant vigilance, and sometimes stern severity.

The conduct of our students is, generally speaking, good. Some, of course, do not work so well as they should, and a few are both idle and troublesome; but the great majority are quiet, industrious, and well-behaved young men. Whenever I find one persistently idle and mischievous, or vicious, I send him home, because my experience is that such boys almost invariably get worse instead of better, where they have so many companions.

During the past year I found it necessary to suspend five from the boarding house—three weeks each, for card-playing, in violation of the rules; to send three home for total failure in examinations; to dismiss two for persistent idleness and frequent violation of rules; and to expel one for card-playing on Sunday and insolent disobedience to an officer of the Institution.

III.—THE BUSINESS DEPARTMENT.

Under this head there is a variety of work for which the President and the Bursar are chiefly responsible—correspondence, books and accounts, general business, and the finances.

Correspondence.

Most of the correspondence falls to the lot of the President, and consists chiefly in sending out circulars, distributing reports, and answering inquiries about terms of admission, course of study, duties of students, cost of board and tuition, books used, books recommended, etc. Last year I distributed 1,700 copies of our last Annual Report, sent out about 900 circulars, and wrote, on an average, from five to six letters a day. Reports were sent to Agricultural Colleges in Britain and the United States, to most of the granges in Ontario, and to all private persons who sent for copies.

Books and Accounts.

The Bursar, as financial agent of the Institution, is responsible for the work under this head. It is his duty to examine all accounts against the College and the Farm, to check them by invoices and requisitions, to charge each item under the proper heading, and make out separate statements for the College and the Farm once a month, submitting the former to the President and the latter to the Farm Superintendent for approval, and then to forward both to the Treasury for payment. He receives and accounts for all moneys from the College, the Farm, and the Treasury Department, and pays all accounts that have been approved by the President or the Farm Superintendent, and passed by the Auditor. He also keeps three sets of books:—

No. 1, showing the monthly expenditure under each head of the appropriation for the College and boarding house.

No. 2, giving in detail the revenue and expenditure of the outside departments under the Farm Superintendent.

No. 3, showing the account of each student from the day he enters the College till he leaves it—tuition fees, board and washing, amounts allowed for labour, and cash balances paid the College for board and washing.

Printed sheets containing the names of all the students are furnished each foreman daily, who fills in the blanks with the description of the work done that day by the students in his department, the number of hours each has worked, and the estimated value of such work. These are filed daily in the office, and journalized weekly. At the end of the financial month these sums are posted to the credit side of each student's account in the ledger, whilst on the debit side is placed the cost of the board and washing for that month, as obtained from the books of the store-room and the laundry. Two hundred and six such accounts were made out last year.

General Business.

In addition to his duties as book-keeper, the Bursar has to provide supplies for the boarding house and take charge of the store-room. He is required to examine and weigh the meat and groceries as they are delivered, and see that the quality of all articles furnished by tender is up to the standard required by the terms of contract.

The President signs requisitions for all purchases, takes charge of the College buildings generally, and is responsible, not only for the management, but for the discipline of the inside departments, as regards both officers and students.

Finances.

The financial tables in Appendix 5 contain a brief statement of the College and Boarding-house accounts for the year 1882, and the estimated expenditure for 1883. Table No. 1 shows the expenditure under the various heads; No. 2, the revenue from all sources; No. 3, the College account with the Farm and the Garden, for the past year; and No. 4, the estimated expenditure for 1883.

The total expenditure in 1882, on the regular account, was $31,374.79, and for an extra year's fuel, $2,512.13. When I came to the Institution the vote for fuel was a year behind, and remained so till last year. The money voted in 1881 was to pay for fuel purchased in 1880, and that voted in 1882 was for fuel purchased in 1881. Consequently I had to buy on seven or eight months' credit, till June last, when you decided to advance $2,512.13, rather than allow the irregularity to continue. The revenue and expenditure for the year may be formally stated as follows:—

Total expenditure on regular account		$31,374 79
Sum voted by Legislature	$22,424 25	
Revenue from fees and board	8,637 16	
		$31,061 41

Over expended on regular account	$313 38
Extra year's fuel paid by Treasury Department	2,512 13
	$2,825 51

Analysis of Revenue:

Tuition Fees	$3,670 00
Balances on Board Accounts	4,936 16
Supplemental Examinations	31 00
Total College Revenue in 1882	$8,637 16

This amount, subtracted from the gross expenditure, shows the net expenditure of the College for the last twelve months—

Gross Expenditure in 1882	$31,374 79
Revenue in 1882	8,637 16
Net Expenditure in 1882	$22,737 63

The amount deducted from students' board accounts for work done in the outside departments last year, was $4,421.68. If this were added to the revenue given above, the net expenditure for the year would be reduced to $18,315.95, thus:

Gross Expenditure, 1882		$31,374 79
Revenue in 1882	$8,637 16	
Allowed to students for labour in outside departments	4,421 68	
		13,058 84
Balance		$18,315 95

In the right hand column of Table 4 will be found the estimated expenditure for the year 1883. Salaries and wages remain almost the same as they were, except a money allowance to the Professors of Chemistry and Biology for their board and lodging, which were furnished by the College last year; so that the only items which need any explanation are *meat* and *fuel*—an increase of $300 for the former, and $200 for the latter, both of which are made necessary by the very marked increase in the price of these articles, especially in all kinds of meat.

MISCELLANEOUS ITEMS.

Library.

A very important factor, in the education given here, is our Library of about 4,000 volumes, selected and added to from time to time, with reference to the present work and future wants of our students. We have not only a good representation of the best books which treat of the several branches taught in the Institution, but also a large number of volumes on history, biography, travels, poetry, and general literature, as well as the latest and best dictionaries and encyclopædias. The Professor of Chemistry acts as Librarian, and under his direction a student gives out and exchanges books, for an hour every day at noon. A catalogue of the books will be found in Part VII. at the end of this Report.

Reading Room.

In our Reading Room, which may be described as large, commodious, and well-lighted, we have thirty-nine papers and magazines on file—four sent free, thirty furnished by the College, and five by the Literary Society.

Papers and Magazines.

(a) Sent Free by the Publishers.

Journal of Commerce, Montreal.
Journal of Agriculture, Montreal.
Canadian Entomologist, London.
Monthly Weather Review, Toronto.

(b) Furnished by the College.

Daily Globe.
Daily Mail.
Weekly Globe.
Weekly Mail.
Guelph Mercury.
Guelph Herald.
Canadian Farmer and Grange Record.
Farmer's Advocate.
Rural Canadian.
Grip.
Canadian Lumberman.
North British Agriculturist.
Irish Farmer's Gazette.
Mark Lane Express.
National Live-Stock Journal.
Scientific American.
Scientific American Supplement.
Boston Journal of Chemistry.
American Agriculturist.
Cultivator and Country Gentleman.
City and Country.
Country Gentleman's Magazine.
Gardener's Monthly.
Veterinarian.
Veterinary Journal.
Aberdeen Free Press.
St. John Telegraph.
Good Words.
Sunday Magazine.
Quiver.

(c) Furnished by the Literary Society.

London Graphic.
Punch.
Century Magazine.
Nineteeth Century.
Fortnightly Review.

Museum.

We have also a room set apart for a museum in the south end of the College buildings, not so large as we could wish, but fairly well adapted to the purpose. If the roof were raised, a gallery constructed, additional windows put in the east end, and the whole room re-floored and re-fitted, we could soon make a very interesting and useful display of grain, seeds, and specimens in Natural History, Entomology, Geology, Meteorology, etc.

Under several of these heads we have already a very fair collection, most of which has recently been classified and arranged by the Professor of Biology, who acts as curator of the museum. For a classified list of the specimens now on hand, please turn to the appendix to Professor McMurrich's report in the third part of this volume.

Literary Society.

The Literary Society in connection with the College, was never more active, vigorous, and useful than at the present time. The members of this society meet every Friday evening in one of the class-rooms, to practice reading, debating, and declamation. The discussions are often quite spirited; and the work done is, undoubtedly, a very valuable addition to the educational appliances of the Institution. In the performance of such work, the young men have an opportunity of testing their ability before they assume the responsibilites of life on a broader scale. They learn to speak in public, and gradually become acquainted with the rules of order according to which public meetings are conducted. Their wits are sharpened, their reasoning powers developed, and their manners improved. Last year the funds of the society were spent in the purchase of papers, magazines, reviews, and prizes for reading, essay-writing and public speaking.

Changes in Staff.

Since the publication of our last report, there has been only one change in the teaching staff of the Institution. Our Professor of Chemistry, J. Hoyes Panton, M.A., resigned his position in February last, and was succeeded by R. B. Hare, B.A., Ph.Dr. (Breslau). Without a labaratory, with very scanty equipment, and in spite of many discouragements, Professor Panton laboured hard for four years to build up and develop the department which he so ably represented. He was a lover of science, an indefatigable worker, a very successful teacher; and, while I am strongly opposed to the tendency to lavish praise indiscriminately upon those who are going to some other part of this world, or have left it altogether, I feel that it is cold modesty to say that in the matter of promptness and system in work, fidelity to duty, loyalty to superiors in office, and willingness to oblige, Professor Panton has few, if any, equals. It was, therefore, no small loss to the Institution and to me personally, when Mr. Panton gave up his professorship here for a more lucrative position in Winnipeg. I am pleased, however, to be able to say that his successor, Dr. Hare, is a man of undoubted scientific attainments—a doctor of science *magna cum laude*, an enthusiastic worker, and a successful lecturer.

Wants and Recommendations.

Our wants are numerous, as usual; but I shall confine my remarks to a few of the most urgent:—

1. A washing machine worked by steam in the laundry.
2. Three or four medium sized steam kettles and a new range in the kitchen.
3. Lowering of steam boilers now used for heating College buildings.
4. Alterations in museum—raising roof, constructing stairway and gallery, re-flooring, re-fitting, and furnishing.
5. Removal of barns, stables and sheds; and use of materials in construction of new farm buildings on site indicated on plan of grounds, in order to make room for Chemical Labaratory and new Green and Propagating Houses, with a class-room and Botanical Laboratory attached.

It is unnecessary for me to dwell on each of these items separately, but simply to say that we cannot get on much longer without a new range in the kitchen; that the lowering of the boilers is an absolute necessity; that it is useless for us to do much in the museum till the alterations in the room are completed; and that the most pressing wants of the Institution in the all important department of Natural Science, cannot be provided for till the farm buildings now in use are removed to a new site. In view of these facts, it is to be hoped that the Department of Public Works may consider it right and expedient to provide for the above items in the Estimates of 1883.

There is one other matter to which I would refer briefly, *i. e.*, the appointment of a

Steward. In my opinion, the time has come when such an appointment is not only proper, but in the strictest sense of the word necessary. In order to attend properly to the financial business of the College and the Farm, the Bursar should be in his office at the College from nine in the morning till five in the evening. At the same time, he should go frequently to the market to buy supplies for the boarding house, and should check the quantity and examine the quality of all articles delivered at the store-room for use in the College; but, as a matter of fact, he cannot be in two places at the same time. Hence the need of dividing up the work in this department. You know how difficult it is to get a young, unmarried man, who is qualified to lecture, and, at the same time, control so large a number of young fellows in the dining-room, dormitories and elsewhere. When we do get such a man, he remains with us only till he can prepare himself for something better. Consequently we are never done searching for one that combines the necessary qualifications for the position of Assistant Resident Master. Hitherto I have myself occupied a few rooms in the centre of the main building, and my presence there has relieved my assistant of much responsibility and many difficulties; but when I move into the apartments now occupied by Professor Brown's family, it will be very different. In fact, it will be impossible for one assistant to control three stories of dormitories in the front building and two stories in the rear building, unless I remain in one of the buildings, not only all day, but also till eleven o'clock at night, five days out of the week—till it is certain that every one is in bed and all lights out. I think, therefore, that I am justified in recommending that a married man be appointed as Steward, to take charge of the store-room and dining-room, look after the halls and dormitories, give instruction in drill and gymnastics, and assist generally in the discipline and management of the boarding house. If such an appointment were made, I could get an assistant for less money than is now paid, and the amount expended for drill and gymnastics could be applied in part payment of the Steward's salary.

STUDY OF AGRICULTURE.

Course of Reading for Farmers' Sons.

After speaking at some length of the work which our College is doing, it may not be amiss to refer briefly to the provision which is now made in part and should be more fully made, for the study of Agriculture in the primary and intermediate schools of this Province. No one will deny that the first and most important function of all our Public Schools, is to teach well the elements of an English education—Reading, Writing, Spelling, Arithmetic, English Grammar, Composition, and the outlines of Geography; but, if in addition to these, or in connection with them, anything else can be taught in the rural schools, there is no doubt that Agriculture, underlying, as it does, the prosperity of every class in the community, should receive attention before Algebra, Euclid, or anything else that has yet found a place on the programme of studies. If by any means we could furnish the rising generation of farmers in this Province with such information as would enable them to raise two cattle or sheep where one is now raised, to make two pounds of butter or cheese where one is now made, to grow two bushels of apples where one is now grown, or to draw from the soil and atmosphere six or eight bushels per acre of grain more than their fathers are now getting, the effect on every profession, trade and department of business would be marvellous—the country would be surprised at its own prosperity; and this being so, it is manifest that the State should not only make ample provision for giving instruction in Agriculture, but should, by all legitimate means, seek to encourage young men to study the subject.

For the last three or four years, a number of the most intelligent and progressive farmers and a few others have been discussing this question. The amount of time spent in studying some subjects that are of very little practical value, has been complained of; and the necessity for a change has been urged with more or less persistency, till, at length, the Minister of Education has been induced to give Agriculture a place on the programme of work prescribed for both the Public and the High Schools of this Province. This is undoubtedly a step in the right direction, and one that will receive the approval of all classes of the population; but it does not go far enough. Something more must be done, before we can look for much practical benefit from the change. In the Public Schools, at least—the only schools that the great majority of the people can attend—we maintain thae so important a subject as Agriculture should not be left in the optional list of studies. It should be placed in the fixed list, and provision at once made in the Normal Schools at Toronto and Ottawa, for giving all teachers in training a full course of lectures on the subject.

In the meantime, however, something might be done to encourage teachers to qualify themselves for the changed condition of things, and to induce farmers' sons, whether at school or not, to spend a portion of their time during the winter evenings, in acquiring such information regarding their own occupation, as would enable them to adopt more enlightened and profitable methods of farming than those which prevail in many parts of the Province at the present time. A course of study could be prescribed, examinations held, and certificates granted annually—all with scarcely any change in the present educational machinery, and a very small addition to the present outlay for printing and examiners. Examination papers on Agriculture could be prepared and sent out with the Intermediate examination papers to all the High Schools, and the answers returned either to the Minister of Education, or to the Secretary of the Agricultural and Arts Association, so that the only expense would be for the payment of examiners, under the supervision of the Minister of Education, or the Council of the Agricultural and Arts Association. At first, no doubt, the number of candidates would be very small; but it would soon increase, and I have no doubt that in a few years the results would be most gratifying to all concerned. Already the Council of the Agricultural and Arts Association has asked for $500 for this purpose; and with the same object in view, I beg to submit the following suggestions as to certificates, course of reading, and books of reference:—

Second and Third Class Certificates.

For the Third Class Examination, the questions should be prepared with the view of ascertaining the candidate's knowledge of the first principles of Agriculture—such as could be learned from a general course of reading on the subject, or from elementary lectures, without special study of the natural sciences.

For the Second Class Examination, a broader and more exact knowledge of the subject would be required, and the questions should be of such a character as to test the general attainments of the candidate, and, at the same time, enable him to give proof of excellence in those branches of the subject to which he may have devoted special attention.

Course of Reading for Third Class Certificates.

1. Different kinds of soils; their properties; variations in their composition, texture, and condition; essential differences between good and poor soils. Substances found in plants; and sources whence they are obtained. Exhaustion of land; causes; how prevented; best modes of restoring exhausted lands. Necessity for manure; production and waste of farm yard manure; use and manufacture of artificial manures; lime, salt, gypsum, bone dust, and mineral superphosphates as manures.

2. *Tillage Operations.*—Ploughing, harrowing, rolling, etc.; respective advantages and disadvantages of deep and shallow, fall and spring ploughing; sub-soiling; fallowing; drainage, where necessary and how done; effects of thorough tillage on lands; times and methods of sowing; after cultivation; harvesting.

3. The crops which each kind of soil is best adapted to produce; succession or rotation of crops; importance and necessity of rotation; rotations suitable to different soils and climates in Ontario; good courses of cropping; bad courses of cropping.

4. *Live Stock;* best kinds of stock for various farms and localities; summer and winter management; economy of good management; general rules for guidance in breeding; conditions and circumstances favourable to cattle farming, sheep farming, dairy farming, and mixed husbandry.

5. *Food;* chemical elements and compounds found in the most important kinds of feed and fodder which can be successfully grown in Ontario; different materials necessary for growth, maintenance of heat, and laying on flesh; feeding and fattening of animals.

Course of Reading for Second-Class Certificates.

1. *The Plant.*—Relations of the mineral, vegetable, and animal kingdoms to each other; nature and sources of plant food; composition of the most important crops grown in Ontario; period of highest nutritive value; chemical changes in the ripening of fruit, grain, and fodder crops; influence of climate on perfection of growth.

2. *The Soil.*—Physical and chemical properties of soils; classification of soils as determined by these properties; comparative fertility of different varieties of soil; active and dormant ingredients of soils; best means of converting dormant into active.

Chemical and physical conditions affecting the barrenness and fertility of soils; causes of unproductiveness; power of different soils to hold manures; influence of frost, aspect, elevation, and climate on the productiveness of soils.

3. *Manures.*—Production, management and application of farm-yard manure; conditions which influence its quality; comparative values of cattle, sheep, and horse manures; green crop manuring; composts.

Properties and uses of artificial manures: lime, plaster, salt, bone-dust and mineral superphosphates as manures; circumstances under which each should and should not be used; times and modes of application; how to avoid the waste of such manures in the soil; their action on seeds and young plants; favourable and unfavourable action at different stages in the growth of crops; action of nitrates and ammoniacal manures on cereals, roots and grasses; special action of salt when used alone, and also in connection with other manures.

Night soil and animal manures; combinations of manures for certain purposes; manures which impoverish the soil; quantities of manures to be used on various soils with different crops; general principles regulating the selection of manures.

4. *Tillage Operations.*—Deep and shallow ploughing, fall and spring ploughing, subsoiling, rolling, fallowing, &c.; advantages and disadvantages of each; preparation of land for different crops, as fall wheat, spring wheat, barley, oats, peas, and maize; differences in cultivation of light and heavy soils.

5. *Seed and Sowing.*—Quality of seed; importance of using clean and pure seed; effect of age on the character of crop, its rapidity of growth, and liability to disease; quantity of seed per acre; methods and depth of sowing; change of seed, why necessary.

6. *Roots.*—Cultivation of roots and tubers—turnips, mangolds, carrots, beets, and potatoes.

7. *Green Fodders.*—Oats and peas, tares, lucerne, sainfoin, prickly confrey, clovers, etc.; their comparative values; the management most appropriate for each; management of pastures.

8. *Rotation of Crops.*—Crops which each kind of soil is adapted to produce; succession or rotation of crops; importance and necessity of rotation; principles underlying it; rotations suitable to different soils, climates, and systems of farming in Ontario; their effects on the land.

9. *Drainage.*—Principles of drainage; effects on soil and sub-soil; laying out and construction of drains.

10. *Exhausted Lands.*—Causes of exhaustion; how avoided; best means of restoring and enriching impoverished land.

11. *Breeding of Animals.*—Principles for guidance in stock-breeding; reproductive powers—how strengthened or weakened; pedigree influence—how intensified or reduced; loss of size in pedigree stock; how to control good or bad qualities; maintenance of constitutional vigor; common causes of barrenness in male and in female; special aptitudes of certain breeds for different conditions of soil and climate; principles which regulate special peculiarities, such as early maturity, rapid production of flesh, production of milk, growth of wool, etc.

Horses.—Most valuable breeds of horses for this Province; the leading characteristics of each; type of horse required for farm work; breeding, feeding, and general management; common diseases and their treatment.

Cattle.—Characteristic points—merits and demerits of Shorthorns, Herefords, Polled Angus, Ayrshires, Jerseys, Devons, Galloways and Holsteins; in and in breeding;

breeding in the line; results of each system; grade cattle; milch cows—points of a good milk cow; general management; economy of good management; conditions affecting quantity and quality of milk. Common diseases and remedies.

Sheep.—Characteristics of different breeds; long-wooled, medium-wooled, and short-wooled sheep; crosses between different breeds compared; influence of breed, climate, food, soil, and shelter on the quantity and quality of wool—evenness, lustre, yolk, fineness of fibre, felting power, etc.; feeding; winter and summer management; management of ewes before, during, and after lambing season; rearing of lambs.

Swine.—Characteristics of the most important breeds of pigs; management of sows and stores; bacon curing, etc.

12. *Food and Feeding.*—Composition and properties of the most important varieties of feed and fodder available to the Ontario farmer; classification of foods; chemical results in the use of different foods; "heat-producing" and "flesh-forming" ingredients in food; best methods of combining these in feeding, so as to secure desired results; points to be observed in order to obtain the full value of natural and artificial foods; increase of value by preparation of food; shelter and warmth as means of economising food; chemical changes produced in malting of barley; its action and value as a feeding material; "good and bad systems of feeding."

13. *Diseases of Crops.*—When plants are most liable to disease; causes of disease; chlorosis; fungoid diseases, as bunt, smut, rust and mildew; remedies.

14. *Orchards.*—Planting, cultivation, pruning, grafting, etc.; best varieties of fruit-trees for different soils and climates of Ontario; diseases, and insect pests.

15. *Forestry.*—Planting and cultivation of forest trees, shade and ornamental trees, etc.

16. *Entomology.*—Common insects injurious to vegetation; their habits and the best means of checking and preventing their ravages.

Books of Reference.

Hand Book of Agriculture, embracing soils, manures, rotation of crops and live stock (Wrightson); *First Principles of Agriculture* (Lawson and Tanner); Report of the Ontario Agricultural Commission; *The Canadian Farmer's Manual of Agriculture*, (Whitcombe); *New American Farm Book*, (Allen); *Farming for Profit*, (Read); *Talks on Manures*, (Harris).

Elements of Agricultural Chemistry and Geology, (Johnston & Cameron); *The Chemistry of Common Life*, (Johnston by Church); *How Crops Feed*, (Johnson); *How Crops Grow*, (Johnston).

Stock Breeding, (Miles); *The Complete Grazier*, (Youatt & Burn); *The Live Stock of the Farm*, (Pringle); *Illustrated Stock Doctor and Live Stock Encyclopædia*, (Manning); *Manual of Cattle Feeding*, (Armsby); *The Shepherd's Own Book*, (Youatt, Skinner & Randall); *American Shepherd*, (Morrell); *The Horse in the Stable and the Field*, (Stonehenge); *Harris on the Pig*.

Annual reports of the Entomological Society of Ontario; *Harris's Insects Injurious to Vegetation.*

Regarding these books it is scarcely necessary to state that they are only a few out of a large number that might be named: and I do not presume to say that a much better selection could not be made. All I wish is to indicate in outline what might be done to promote the study of Agriculture throughout the Province.

I have the honour to be, Sir,

Your obedient Servant,

James Mills,

President.

APPENDIX 1.

1. COLLEGE ROLL FOR THE YEAR 1882.

2. COLLEGE ROLL FOR THE SESSION 1882–'83 (1st Oct. to 31st March).

1. COLLEGE ROLL FOR THE YEAR 1882.

NAMES.	P. O. ADDRESS.	COUNTY, ETC.
Anderson, H. F.	London	Middlesex.
Austin, W. C.	Ottawa	Carleton.
Aylsworth, H.	Deseronto	Prince Edward.
Ardagh, A. E.	Barrie	Simcoe.
Barclay, E. H.	St. Andrew's	Scotland.
Bethune, K.	Ottawa	Carleton.
Bignell, E.	Claude	Peel.
Blanchard, M. G.	Windsor	Nova Scotia.
Begg, R. A.	Orillia	Simcoe.
Broughton, C. J.	Hamilton	Wentworth.
Brown, W.	Guelph	Wellington.
Bowes, J. B.	Pinkerton	Bruce.
Bowes, J. C.	Halifax	Nova Scotia.
Bowman, B.	Westmontrose	Waterloo.
Black, C. H.	Amherst	Nova Scotia.
Black, P. C.	Windsor	Nova Scotia.
Boyd, J. L.	Toronto	York.
Ballantyne, A. W.	Stratford	Perth.
Buckingham, F.	Stratford	Perth.
Boyle, R. H., (Viscount)	Castle Martyr	Ireland.
Boyle, Hon. H. G.	Castle Martyr	Ireland.
Braun, P. E.	Ottawa	Carleton.
Chase, O.	Cornwallis	Nova Scotia.
Cunningham, C. G.	Ottawa	Carleton.
Cutting, A. N.	Lynn	England.
Clarke, F.	Parkdale	York.
Clark, C.	Parkdale	York.
Carnegie, J.	Peterboro'	Peterboro'.
Creelman, J. A.	Collingwood	Grey.
Cowley, E. A.	Windsor	England.
Cameron, H. H.	Ottawa	Carleton.
Carpenter, C.	Simcoe	Norfolk.
Carpenter, P. A.	Collingwood	Simcoe.
Courbarron, F. H.	St. Andrew's	Scotland.
Cream, W. C.	Paisley	Bruce.
Cross, E.	Montreal	Montreal.
DeVeber, W. H.	St. John	New Brunswick.
Donaldson, J.	Wolfville	Nova Scotia.
Dickinson, G. A.	Zion	Durham.
Davis, R. A.	Cayuga	Haldimand.
Dawson, J.	South Zorra	Oxford.
Dewar, J. D.	Tiverton	Bruce.
Dennis, J.	Weston	York.
Duthie, J.	Guelph	Wellington.
Day, F.	Kingston	Frontenac.
DeWinton, W. F.	Ottawa	Carleton.
Denne, T. H.	Peterboro'	Peterboro'.

1. COLLEGE ROLL FOR THE YEAR 1882.—*Continued.*

Names.	P. O. Address.	County, Etc.
Domville, H. T.	Hamilton	Wentworth.
DeChadenèdes, F. B.	London	England.
Elworthy, R. H.	Norwich	Oxford.
Eddington, D. C.	Glencreggan	Scotland.
Edmundson, J. A.	Orillia	Simcoe.
Eidet, W.	Philipsburg West	Waterloo.
Edgar, A. E.	Toronto	York.
Erskine, H. R.	Ottawa	Carleton.
Ferguson, G. A.	Kingston	Frontenac.
Ffolkes, R. W.	Hillington Lynn	England.
Fraser, T. A.	Kinburn	Carleton.
Frith, H. M.	St. John	New Brunswick.
Fotheringham, W.	St. Mary's	Perth.
Fuller, S. G.	Stratford	Perth.
Finlayson, H.	Trinidad	West Indies.
Gilpin, W.	Ottawa	Carleton.
Gilpin, R. R.	Halifax	Nova Scotia.
Gibson, R.	Glen Allen	Wellington.
Goold, G. E.	Kingston	Frontenac.
Garland, C. S.	Montreal	Montreal.
Gillespie, J. W.	Innerkip	Oxford.
Gregory, J.	Fredericton	New Brunswick.
Greenlaw, F. W.	Plymouth	England.
Grindley, A.	Montreal	Montreal.
Hallesy, F.	Merthyr Tydvil	Wales.
Howitt, W.	Guelph	Wellington.
Havard, B. T.	Merthyr Tydvil	Wales.
Holden, W. L.	Hamilton	Wentworth.
Hutton, J. R.	St. Catharines	Lincoln.
Hutton, W. E.	St. Catherines	Lincoln.
Holcroft, H. S.	Orillia	Simcoe.
Holpkins, J. A.	Holt	York.
Hanson, E. T.	Constantinople	Turkey.
Harrison, F. W.	Owen Sound	Grey.
Hubbard, W. W.	Burton	New Brunswick.
Homfray, P.	Hales Owen	England.
Hannah, J.	Egmondville	Huron.
Ings, F. W.	Charlottetown	Prince Edward Island.
Jones, W. S.	Halifax	Nova Scotia.
Jeffs, H. B.	Bond Head	Simcoe.
Joseph, S. S.	Quebec	Quebec.
Jones' Williams, A. H.	Swansea	Wales.
Jordan, A. W.	Simonds	New Brunswick.
Kestell, R. H.	Simcoe	Norfolk.
King, J. E.	Middlemarch	Elgin.
Kelly, S. A.	Fairview	Wentworth.
Keil, C. A.	Chatham	Kent.
Lindsay, W.	Woodstock	Oxford.
Lindsay, S. G.	Woodstock	Oxford.
Law, F. G.	Stratford	Perth.
Luton, E. E.	New Sarum	Elgin.
Lough, W. H.	Clinton	Huron.
Latimer, R. Mc.	Marshville	Welland.
Lehmann, A.	Orillia	Simcoe.
Little, W.	Killyleagh	Simcoe.
Mahony, E. C.	Hamilton	Wentworth.
Major, C. H.	Croydon	England.
Maunsell, G. S.	Ottawa	Carleton.
Messecar, C. L.	Scotland	Brant.
McDonald, J.	Petrolia	Lambton.
McLennan, A.	Ottawa	Carleton.
McLennan, D.	Camerontown	Glengarry.
McLennan, J. D.	Lancaster	Glengarry.

1. COLLEGE ROLL FOR THE YEAR 1882.—*Continued.*

NAMES.	P. O. ADDRESS.	COUNTY, ETC.
Maughan, W. E	Owen Sound	Grey.
Monteith, W	Exeter	Huron.
Morton, F. G	Barrie	Simcoe.
McKim, J.	Parker	Wellington.
McKercher, W	Wroxeter	Huron.
McNish, C. N	Lyn	Leeds.
McPherson, D.	Glanworth	Middlesex.
Magor, J. F	Montreal	Montreal.
Minard, W	St. Thomas	Elgin.
McMartin, A. M	Martintown	Glengarry.
McLeod, M. D	Oak Ridges	York.
McPhail, E	Toronto	York.
Miller, J. P	Norwich	England.
McIntosh, G. H	Mossboro'	Wellington,
Mathewson, G.	Montreal	Montreal.
McLean, J. R	Innerkip	Oxford.
Merritt, C. L	Scotland	Brant.
Mohr, A	Cincinnati	Ohio.
Malcolmson, K. G	East Barnet	England.
McDonald, W. A	Stratford	Perth.
Moyle, F. T	Davis	Brant.
McGregor, J	Colborne	Northumberland.
Neilson, J	Lyn	Leeds.
Nicol, G	Cataraqui	Frontenac.
Newport, E. T	St. George	Bermuda.
Ord, W.	Toronto	York.
Philbin, T. R	Ottawa	Carleton.
Pope, E	Sarawak	Grey.
Patterson, W	Merritton	Lincoln.
Perry, D. E	Winnipeg	Manitoba.
Pope, A. H	London	England.
Pope, H	Sarawak	Grey.
Paton, G. C	Langside	Scotland.
Pinhey, H. R	Ottawa	Carleton.
Powys, P. C	Fredericton	New Brunswick.
Pearce, J. W	Alymer	Elgin.
Pocock, H. R	Brockville	Leeds.
Poe, J. J	Callan	Ireland.
Raynes, G. S	Côte St. Antoine	Montreal.
Raikes, H	Barrie	Simcoe.
Ryall, F	Paris	Brant.
Rennie, E. A	Hamilton	Wentworth.
Robinson, J. D	Middlemarch	Elgin.
Rose, G. M	Toronto	York.
Robertson, W.	Hanstead	Lambton.
Routh, R. O	Montreal	Montreal.
Ramsay, R. A	Eden Mills	Wellington.
Rogers, F.	Deans	Haldimand.
Rhodes, O	Chatham	Kent.
Riddell, A. A	Kinburn	Carleton.
Redmond, W. J	Peterboro'	Peterboro'.
Ruel, F. C	Southsea	England.
Sharman, H. B	Stratford	Perth.
Shearer, E	Ottawa	Carleton.
Shuttleworth, A.	Mount Albert	York.
Silverthorne, N	Somerville	Peel.
Stover, J. W	Norwich	Oxford.
Smith, J. A	Martintown	Glengarry.
Smith, J. L	Ottawa	Carleton.
Smith, F. W	Scotland	Brant.
Schwartz, J. A	Quebec	Quebec.
Skinner, A. F	Woodstock	Oxford.
Strange, A. W	Kingston	Frontenac.

1. COLLEGE ROLL FOR THE YEAR 1882.—*Continued.*

NAMES.	P. O. ADDRESS.	COUNTY, ETC.
Stevenson, C. R.	Fingal	Elgin.
Saxton, E. A.	Nantwich	England.
Sinclair, A. L.	Montreal	Montreal.
Slater, H.	Taunton	England.
Steers, O.	Ottawa	Carleton.
Soden, F. H.	London	England.
Spohn, H. B.	Ancaster	Wentworth.
Shaw, E. E.	Wolverhampton	England.
Shaw, A. G.	Wolverhampton	England.
Tronson, H.	Oakville	Halton.
Tourangeau, A.	Quebec	Quebec.
Towsend, K. S.	Aldershot	Wentworth.
Thomas, F. J.	Oxford	England.
Torrance, W. J.	Ottawa	Carleton.
Terhune, F.	Brantford	Brant.
Tucker, H. V.	Toronto	York.
Urmston. R. B.	Southsea	England.
White, W. G.	Lanark	Lanark.
White, C. D.	Lanark	Lanark.
Wyndham, W. T.	Roach's Point	York.
Williams, A. W.	Culloden	Oxford.
Wettlaufer, F.	Tavistock	Perth.
Warren, F. F.	Limmosol	Cyprus.
Westlake, G.	Yarmouth Centre	Elgin.
Wilmot, E. M.	London	England.
Weston, G. H.	Ottawa	Carleton.
Whitehead, J.	Brampton	Peel.
Whithead, R.	Broadstairs	England.
Wark, A. E.	Wanstead	Lambton.
Wroughton, T.	Montreal	Montreal.
Willis, W. B.	Whitby	Ontario.
Weatherston, N. C.	Toronto	York.
Weatherston, D.	Toronto	York.
Total		206

2. COLLEGE ROLL FOR THE SESSION 1881-'82 (1ST OCT. TO 31ST MARCH).

NAMES.	P. O. ADDRESS.	COUNTY, ETC.
Austin, W. E.	Ottawa	Carleton.
Ardagh. A. E.	Barrie	Simcoe.
Aylsworth, H.	Deseronto	Prince Edward.
Bowes, J. C.	Halifax	Nova Scotia.
Black, C. H.	Amherst	Nova Scotia.
Black, P. C.	Windsor	Nova Scotia.
Boyd, J. L.	Toronto	York.
Boyle, R. H. (Viscount)	Castle Martyr	Ireland.
Boyle, Hon. H. G.	Castle Martyr	Ireland.
Ballantyne, A. W.	Stratford	Perth.
Bockingham, F.	Stratford	Perth.
Braun, P. E.	Ottawa	Carleton.
Clark, F.	Parkdale	York.
Clark, C.	Parkdale	York.
Creelman, J. A.	Collingwood	Grey.
Cowley, E. A.	Windsor	England.

2. COLLEGE ROLL FOR THE SESSION 1881-'82.—*Continued.*

Names.	P. O. Address.	County, Etc.
Carpenter, P. A.	Collingwood	Simcoe.
Courbarron, F. H.	St. Andrew's	Scotland.
Cream, W. C.	Paisley	Bruce.
DeVeber, W. H.	St. John	New Brunswick.
DeWinton, W. F.	Ottawa	Carleton.
Denne, T. H.	Peterboro'	Peterboro'.
DeChadenèdes, F. B.	London	England.
Edmundson, J. A.	Orillia	Simcoe.
Erskine, H. R.	Ottawa	Carleton.
Eddington, D. C.	Glencreggan	Scotland.
Fotheringham, W.	St. Mary's	Perth.
Fuller, S. G.	Stratford	Perth.
Frith, H. M.	St. John	New Brunswick.
Finlayson, H.	Trinidad	West Indies.
Garland, C. S.	Montreal	Montreal.
Gregory, J.	Fredericton	New Brunswick.
Hanson, E. T.	Constantinople	Turkey.
Harrison, F. W.	Owen Sound	Grey.
Hubbard, W. W.	Burton	New Brunswick.
Hannah, J.	Egmondville	Huron.
Holcroft, H. S.	Orillia	Simcoe.
Ings, F. W.	Charlottetown	Prince Edward Island.
Jeffs, H. B.	Bond Head	Simcoe.
Jones' Williams, A.	Swansea	S. Wales.
Jordon, A. W.	Simonds	New Brunswick.
Kelly, S. A.	Fairview	Wentworth.
Keil, C. A.	Chatham	Kent.
Latimer, R. Mc	Marshville	Welland.
Lehmann, A.	Orillia	Simcoe.
Little, W.	Killyleagh	Simcoe.
Luton, E. E.	New Sarum	Elgin.
Major, C. H.	Croydon	England.
Maunsell, G. S.	Ottawa	Carleton.
Miller, J. P.	Norwich	England.
McLennan, A.	Ottawa	Carleton.
McLennan, D.	Camerontown	Glengarry.
McLennan, J. D.	Lancaster	Glengarry.
McIntosh	Mossboro'	Wellington.
McNish, C. N.	Lyn	Leeds.
McKinn, J.	Parker	Wellington.
McLean, J. R.	Innerkip	Oxford.
Merritt, C. L.	Scotland	Brant.
Mathewson, G.	Montreal	Montreal.
Malcolmson, K. G.	East Barnet	England.
McDonald, W. A.	Stratford	Perth.
McDonald, J.	Petrolia	Lambton.
McPherson, D.	Glanworth	Middlesex.
Morton, F. G.	Barrie	Simcoe.
Mohr, A.	Cincinnati	Ohio.
Moyle, F. T.	Paris	Brant.
McGregor, J.	Colborne	Northumberland.
Neilson, J.	Lyn	Leeds.
Ord, W.	Toronto	York.
Perry, D. E.	Winnipeg	Manitoba.
Paton, G. C.	Langside	Scotland.
Powys, P. C.	Fredericton	New Brunswick.
Pearce, J. W.	Alymer	Elgin.
Pocock, H. R.	Brockville	Leeds.
Poe, J. J.	Callan	Ireland.
Robertson, W.	Hanstead	Lambton.
Rennie, E. A.	Hamilton	Wentworth.
Robinson, J. D.	Middlemarch	Elgin.
Rose, G. M.	Toronto	York.

2. COLLEGE ROLL FOR THE SESSION 1881-'82.—*Continued.*

NAME.	P. O. ADDRESS.	COUNTY, ETC.
Baynes, G. S.	Montreal	Montreal.
Redmond, W. J.	Peterboro'	Peterboro'.
Ruel, F. C.	Southsea	England.
Sharman, H. B.	Stratford	Perth.
Smith, J. A.	Martintown	Glengarry.
Smith, J. L.	Ottawa	Carleton.
Strange, A. W.	Kingston	Frontenac.
Schwartz, J. A.	Quebec	Quebec.
Saxton, E. A.	Nantwich	England.
Sinclair, A. P.	Montreal	Montreal.
Slater, H.	Taunton	England.
Steers, O.	Ottawa	Carleton.
Soden, F. H.	London	England.
Spohn, H. B.	Lancaster	Wentworth.
Shaw, E. E.	Wolverhampton	England.
Shaw, A. G.	Wolverhampton	England.
Torrance, W. J.	Ottawa	Carleton.
Thomas, F. J.	Oxford	England.
Tourangeau, A.	Quebec	Quebec.
Tucker, H. V.	Toronto	York.
Urmston, R. B.	Southsea	England.
Wark, A. E.	Wanstead	Lambton.
Warren, F. F.	Limmosol	Cyprus.
Weatherston, N. C.	Toronto	York.
Weatherston, D.	Toronto	York.
Westlake, G.	Yarmouth Centre	Elgin.
Weston, G. H.	Ottawa	Carleton.
Willis, W. B.	Whitby	Ontario.
Wilmot, E. M.	London	England.
White, C. D.	Hereford	England.
Whitehead, J.	Brampton	Peel.
Whitehead, R.	Broadstairs	England.
Wroughton, T.	Montreal	Montreal.
Total		112

APPENDIX 2.

TIME TABLES FOR FALL TERM (1st October to 22nd December), 1882.

Tables No. 1 and No. 2 indicate the work of the regular students, and No. 3 (A) and (B) the work of the specialists in Live Stock, for the term ending the 22nd December, 1882. No. 1 is the same as No. 2, and 3 (A) the same as 3 (B), except the order of the lectures, which change from forenoon to afternoon, and *vice versa* at the beginning of each week, to suit the arrangements for practical work in the outside departments.

TIME TABLE No. 1.

2nd Year.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7-12	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departm's
Afternoon.	2-3	English Literature.	Statics.	English Literature.	English Literature.	Levelling and Drainage.	Half Holiday.
	3-4	Agricultural Chemistry.	Agricultural Chemistry.	Practical Live Stock.	Meteorology.	Agricultural Chemistry.	
	4-5	Veterinary Pathology.	Agriculture.	English Composition.	Veterinary Pathology.	Practical Horse.	

1st Year—Division I.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7-12	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departm's
Afternoon.	2-3	Arithmetic.	English Composition.	Agriculture.	2. Arithmetic. 2.40. Book-keeping. 3.20. Human Physiology and Sanitary Science.	Agriculture.	Half Holiday.
	3-4	Agriculture.	Human Physiology and Sanitary Science.	English Literature.		Veterinary Anatomy.	
	4-5	Inorganic Chemistry.	Veterinary Anatomy.	Inorganic Chemistry.	Inorganic Chemistry.	English Literature.	

1st Year—Division II.

	Hours.	Monday.	Tuesday	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7-8	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Half Holiday.
	8-9	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	
	9-10	English Composition.	Inorganic Chemistry.	9. Arithmetic. 9.40. Book-keeping. 10.20. Human Physiology and Sanitary Science.	Agriculture.	Arithmetic.	
	10-11	Human Physiology and Sanitary Science.	Agriculture.		English Literature.	Agriculture.	
	11-12	Veterinary Anatomy.	English Literature.	Inorganic Chemistry.	Veterinary Anatomy.	Inorganic Chemistry.	
Afternoon.	1.30-5	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departm's

TIME TABLE No. 2.

2nd Year.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7-8	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Half Holiday.
	8-9	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	
	9-10	English Literature.	Statics.	English Literature.	English Literature.	Levelling or Drainage.	
	10-11	Agricultural Chemistry.	Agricultural Chemistry.	Practical Live Stock.	Meteorology.	Agricultural Chemistry.	
	11-12	Veterinary Pathology.	Agriculture.	English Composition.	Veterinary Pathology.	Practical Horse.	
Afternoon.	1.30-5	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside department.	Work in outside departm's

1st Year.—Division I.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7-8	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Half Holiday.
	8-9	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	
	9-10	Arithmetic.	English Composition.	Agriculture.	9. Arithmetic. 9.40. Book-keeping.	Agriculture.	
	10-11	Agriculture.	Human Physiology and Sanitary Science.	English Literature.	10.20. Human Physiology and Sanitary Science.	Veterinary Anatomy.	
	11-12	Inorganic Chemistry.	Veterinary Anatomy.	Inorganic Chemistry.	Inorganic Chemistry.	English Literature.	
After-noon.	1.30-5	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departm's

1st Year.—Division II.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7-12	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departments.	Work in outside departments.
Afternoon.	2-3	English Composition.	Inorganic Chemistry.	2. Arithmetic. 2.40. Book-keeping.	Agriculture.	Arithmetic.	Half Holiday.
	3-4	Natural History.	Agriculture.	3.20. Natural History.	English Literature.	Agriculture.	
	4-5	Veterinary Anatomy.	English Literature.	Inorganic Chemistry.	Veterinary Anatomy.	Inorganic Chemistry.	

TIME TABLE No. 3.—SPECIAL LIVE STOCK CLASS.

(A) 2nd Year.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7-12	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.
Afternoon.	2-3	Live Stock in Class-room.	Study of Text-Book on Veterinary Practice.	Study of Text-Book on Live Stock.	Live Stock in Class-room.	Study of Text-Book on Live Stock.	Half Holiday.
	3-4	Study of Text-Book on Live Stock.	Veterinary Science or Practice.	Live Stock in Class-room.	Study of Text-Book on Veterinary Practice.	Study of Text-Book on Veterinary Practice.	
	4-5	Veterinary Pathology.	Agriculture.	Veterinary Science or Practice.	Veterinary Pathology.	Practical Horse.	

1st Year.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7-12	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.
Afternoon.	2-3	Live Stock in Class-room.	Study of Text-Book on Veterinary Practice.	Agriculture.	Live Stock in Class-room.	Agriculture.	Half Holiday.
	3-4	Agriculture.	Veterinary Science or Practice.	Study of Text-Book on Live Stock.	Study of Text-Book on Veterinary Practice.	Veterinary Anatomy.	
	4-5	Study of Text-Book on Live Stock.	Veterinary Anatomy.	Veterinary Science or Practice.	Study of Text-Book on Live Stock.	Study of Text-Book on Veterinary Practice.	

(B) 2ND YEAR.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7-8	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Half Holiday.
	8-9	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	
	9-10	Live Stock in Class-room.	Study of Text-Book on Veterinary Science.	Study of Text-Book on Live Stock.	Live Stock in Class-room.	Study of Text-Book on Live-Stock.	
	10-11	Study of Text-Book on Live Stock.	Veterinary Science or Practice.	Live Stock in Class-room.	Study of Text-Book on Veterinary Practice.	Study of Text-Book on Veterinary Practice.	
	11-12	Veterinary Pathology.	Agriculture.	Veterinary Science or Practice.	Veterinary Pathology.	Practical Horse.	
Afternoon.	1.30-5	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.

1ST YEAR.

	Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Forenoon.	7-8	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Study or Recreation.	Half Holiday.
	8-9	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	Drill or Gymnastics.	
	9-10	Live Stock in Class-room.	Study of Text-Book on Veterinary Science.	Agriculture.	Live Stock in Class-room.	Agriculture.	
	10-11	Agriculture.	Veterinary Science or Practice.	Study of Text-Book on Live Stock.	Study of Text-Book on Veterinary Practice.	Veterinary Anatomy.	
	11-12	Study of Text-Book on Live Stock.	Veterinary Anatomy.	Veterinary Science or Practice.	Study of Text-Book on Live Stock.	Study of Text-Book on Veterinary Practice.	
Afternoon.	1.30-5	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.	Work with Cattle, Sheep and Horses.

APPENDIX 3.

ONTARIO AGRICULTURAL COLLEGE.

EXAMINATION PAPERS.

I. PAPERS SET AT THE SESSIONAL EXAMINATIONS, EASTER, 1882.
II. PAPERS SET AT THE SESSIONAL EXAMINATIONS, JUNE, 1882.
III. PAPERS SET AT THE MATRICULATION EXAMINATIONS, OCTOBER, 1882.

1. PAPERS SET AT THE SESSIONAL EXAMINATIONS, EASTER, 1882.

FIRST YEAR.

AGRICULTURE.

Examiner: WILLIAM BROWN.

1. In the following rotation of cropping, give full reasons—theoretical and practical—for its adoption, and point out any weakness in its arrangement :

Peas.
Wheat.
Wheat.
Roots.
Wheat (seeder).
Hay.
Hay.
Pasture.
Pasture.

2. It is desired to construct a road and fence upon the most approved plan, consistent with economy, efficiency and permanency. Illustrate with diagrams and brief notes.

3. When we want to save labour in management, preserve manure, secure permanency, with healthy conditions—irrespective of cost of construction—in the arrangement of barn, stables, &c., for mixed farming in Ontario, what principles should guide the builder ?

FIRST YEAR.

LIVE STOCK.

Examiner: WILLIAM BROWN.

1. What is meant by a pure bred animal, a cross, a grade, and an inside cross, in breeding ?

2. Compare the build and characteristics of the Hereford and Aberdeen Poll breeds of cattle.

EASTER EXAMINATIONS, 1882.—Continued.

3. Compare the build and characteristics of the Ayrshire and Jersey breeds of cattle.

4. Classify, price and describe fully the character of the accompanying sample of wool.

5. Make comparative notes on the build and characteristics of the Leicester and Southdown breeds of sheep.

6. Distinguish between the shearling grades of Oxford and Shropshire Down sheep.

FIRST YEAR.

INORGANIC CHEMISTRY.

Examiner: R. B. HARE, PH.DR.

1. (i.) How many cubic centimeters of oxygen gas, measured at 15 degrees and 780 mm. pressure, can be obtained by heating 10 grammes of potassium chlorate?
   (ii.) You are given oxygen, nitrous oxide, and nitric oxide gases in separate belljars, how would you proceed to distinguish them?
2. (i.) How would you ascertain the composition of water by volume analytically and synthetically?
   (ii.) Explain the terms "temporary" and "permanent hardness," and state how they may be removed.
3. (i.) Explain the bleaching action of chlorine.
   (ii.) Illustrate by formulæ the chemical action that occurs when the goods to be bleached are first dipped in a solution of *bleaching powder*, and then drawn through dilute hydrochloric or sulphuric acid.
4. (i.) Give the preparation and properties of phosphoric acid.
   (ii.) What important relations do phosphoric and nitric acids hold to agriculture?
5. (i.) Describe the properties of the three allotropic modifications of carbon.
   (ii.) How is carbonic acid related to the animal and the vegetable kingdom?
6. (i.) Give the preparation of hydrochloric and nitric acids.
   (ii.) How would you distinguish them *chemically* and *physically*?
   (iii.) Explain the chemical action of the two acids when united.
7. (i.) How would you prepare soluble and insoluble *silica?*
   (ii.) What occurs when sillicon tetrafluoride is allowed to bubble up in water?
8. Describe and explain any experiment you may have made.

FIRST YEAR.

ORGANIC CHEMISTRY.

Examiner: R. B. HARE, PH.DR.

1. (i.) Name some of the chief peculiarities of the carbon compounds.
   (ii.) Explain the terms "saturated" and "non-saturated" carbon compounds, giving examples.
   (iii.) Distinguish empirical from rational formulæ.
2. (i.) Write down a list of the first eight primary alcohols, with their derived acids.
   (ii.) Indicate by structural formulæ the relation existing between an alcohol and the aldehyde, the acid and the ether obtainable from it.
3. Give the preparation and properties of ethyl alcohol.

EASTER EXAMINATIONS, 1882.—Continued.

4. Describe *the continuous etherification process,* using mythl and ethyl alcohol.

5. Explain what is meant by *the acetous fermentation.*
   (i.) What is the peculiar test for acetic acid, or the soluble acetates?
   (ii.) Give the composition of *red* and *iron liquors,* and explain their use.

6. How are the acids of the lactic series and of the oxalic series derived from the corresponding divalent alcohol or glycols?
   (i.) Describe the manufacture of oxalic acid from saw dust.
   (ii.) How many grammes of oxygen are required to oxidize a molecule of glycolic acid to oxalic acid?

7. Name the following compounds: $\left.\begin{array}{l} C_2H_5 \\ C_2H_5 \\ C_2H_5 \end{array}\right\} N$, $\left.\begin{array}{c} C_3H_7 \\ H \\ H \end{array}\right\} N$,

$\left.\begin{array}{c} C_2H_5 \\ C_2H_5 \\ H \end{array}\right\} P$, $(CH_3)_3\,As$, $As_2\,(CH_3)_4$ $(C_2H_5)_3\,Sb$,

$C_2Cl_3\,OH$, C_3H_6, C_4H_{10}, $C_3H_5O_3\,(C_{16}H_{31}O)_3$

8. (i.) What is the composition of the natural oils and fats?
   (ii.) Explain the old and new process of soap making.

9. What is the action of yeast and dilute sulphuric acid on cane sugar?

FIRST YEAR.

ZOOLOGY.

Examiner: J. PLAYFAIR MCMURRICH, M.A.

1. Describe the structure of the coral animal. Account for the various forms assumed by coral reefs.

2. Classify the following:—Sea-urchin, trichina, cray-fish, iguana, oyster.

3. Describe briefly the life-history of a bee-hive.

4. Mention the characteristics of the *vertebrata.*

5. Give the principal orders of the class *pisces,* mentioning the more important members of each order.

6. Describe the modifications of the heart seen in the *vertebrata.*

7. What are the characteristics of the *ophidia*? Describe some of the more important members of the order.

8. Give the habits of the woodpeckers and robins. Discuss their usefulness from an agricultural point of view.

9. Give the various subdivisons of the order *ungulata,* mentioning some characteristic members of each sudivision. Describe the modifications of the foot in the members of the first sub-order.

FIRST YEAR.

ANATOMY.

Examiner: E. A. A. GRANGE, V.S.

1. Name the bones of the trunk of the ox.

2. Name the bones of the hind extremity of the ox.

3. Describe the foot of the horse.

EASTER EXAMINATIONS, 1882.—Continued.

4. Name the various processes of digestion, and state where and by what organs each process is performed.

5. Name the structures entering into the formation of a joint.

6. Describe the difference between the preparatory organs of digestion of the horse and ox.

7. Name the organs of respiration.

8. Name the organs of circulation.

9. Give the course of the circulation of the blood through the heart and lungs.

10. Name the layers entering into the formation of the skin.

FIRST YEAR.

ENGLISH LITERATURE.

Examiner: J. P. McMurrich, M.A.

1. Give a short account of Goldsmith's life.

2. "A time there was, ere England's griefs began,
When every rood of ground maintained its man;
For him light labour spread her wholesome store,
Just *gave what* life required, but gave no *more*;
His best companions, innocence and *health*.
And his best riches, ignorance of wealth."

(*a*) Point out the figures of speech in this extract.
(*b*) Write notes on *rood*, *wholesome*, and *innocence*.
(*c*) Parse the words in italic.

3. Describe Goldsmith's style, and compare it with that of Cowper.

4. Give the derivation and original meaning of the following words:—(*a*) accumulate, (*b*) murmur, (*c*) peculiar, (*d*) meandering, (*e*) sycophant.

5. "So once were ranged the sons of ancient Rome,
A noble show! while Roscius trod the stage;
And so, while Garrick, as renowned as he,
The sons of Albion; fearing each to lose
Some note of nature's music from his lips,
And covetous of Shakespeare's beauty, seen
In every flash of his far-beaming eye."

(*a*) Write notes on *Roscius*, *Garrick*, and *Albion*.
(*b*) Parse *show*, *sons of Albion*, *beauty*.

6. (*a*) Me, therefore, studious of laborious ease."
(*b*) "And such thine, in whom
Our British Themis gloried with just cause."
(*c*) "Each claiming truth.
And truth disclaiming both."
Name the figures of speech occurring in the above extracts.

7. Give a synopsis of Cowper's "Task," Bk. III.

8. Write a short account of Cowper's life.

EASTER EXAMINATIONS, 1882.—Continued.

FIRST YEAR.

COMPOSITION.

Examiner: R. B. HARE, PH.DR.

1. Farmers' Houses—what they are and what they might be.

2. "Seest thou a man wise in his own conceit? There is more hope of a fool than of him."

3. "In the sweat of thy face shalt thou eat bread."

4. "Put your trust in God, my boys, and keep your powder dry."

5. "Give me again my hollow tree
A crust of bread and liberty."—(*Horace*).

6. "Who dare think one thing, and another tell,
My heart detests him as the gates of hell."

7. "O wad some power the giftie gie us
To see oursels as others see us,
It wad frae monie a blunder free us
An' foolish notion."

FIRST YEAR.

ARITHMETIC.

Examiner: W. NATTRESS, M.B.

1. A labourer dug 120 rods, 5 yards, 2 feet of ditching, at \$2.75 per rod, for which he is to take \$110 in cash, and oats at $37\frac{1}{2}$ cents per bushel. To what quantity of oats will he be entitled?

2. Explain how taxes are levied upon property, and for what purposes. When the income tax is $2\frac{1}{2}$ cents on the \$, a man pays \$62.60. What is his income?

3. \$2,500. GUELPH, January 1st, 1879.

Twelve months after date we promise to pay to John Smith, or order, twenty-five hundred dollars, for value received, with interest.

SHELDON & SON.

On June 1st, 1882, what will the above note be worth, reckoning compound interest, at 6 per cent. per annum?

4. Sold an animal for \$165 on a credit of 10 months, what should be the cash price, money being worth 8 per cent. per annum?

5. Define *Insurance, Premium, Policy*. Name the different modes of life assuring. What will be the premium of insurance on the furniture of a house valued at \$1,800, at $\frac{1}{8}$ per cent.?

6. Three men hire a pasture for their common use for which they pay \$212. One puts in 20 oxen for 3 months, another 24 oxen for 4 months and the third 28 oxen for 2 months. How much of the rent should each pay?

7. Draw out a set of Bills of Exchange on the Bank of England for £5,500. What will such a bill cost in Canada if exchange be at $109\frac{1}{2}$?

8. The flooring of a room 14 ft. 3 in. long by 13 ft. 4 in. broad, is composed of planks 3 in. wide and 10 ft. long. How many will be required?

9. Write out the two kinds of negotiable notes bearing interest at 6 per cent.—one for \$600, the other for \$1,550, and indicate the amount of *bill stamps* required for each. Are any required?

EASTER EXAMINATIONS, 1882.—Continued.

SECOND YEAR.

AGRICULTURE.

Examiner: WILLIAM BROWN.

1. The permanent improvement of a wet, dirty, and impoverished clay loam farm, under mixed husbandry, is to be undertaken, beginning in 1882. What system would you advise, specifiying briefly the nature of the improvements, cropping and manures?

2. Under what circumstances is the extensive application of special fertilizers dvisable, and when is their use not attended with beneficial results?

3. What kinds and quantities of grasses and clovers do you recommend for permanent pastures in Ontario, and what are the most favourable conditions for their establishment.

SECOND YEAR.

LIVE STOCK.

Examiner: WILLIAM BROWN.

1. It is desired to obtain the greatest public amount of the best beef at the least cost within three years, under present Ontario grazing conditions, and liberal winter feeding. Which breed of bulls would secure these upon the common Canadian Cows? Give reasons in full.

2. You have handled and compared males of five and females of seven pure breeds of cattle, as also five grades of some. Make a list of these in the order of merit, according to your views of general purpose value in Ontario.

3. Classify, price, and describe in every respect the accompanying sample of wool.

4. Having in view to meet the wants of the present market for mutton and wool, which breed of rams would you place with common ewes upon the natural pastures of our eastern provinces? Give reasons in full.

5. Write the twelve thoroughbred and grade sheep recently handled and compared. Make a list according to wool texture, and opposite each place the value of its shearling ram or wether.

SECOND YEAR.

ARBORICULTURE.

Examiner: WM. BROWN.

The planting of parts of Ontario will entail *expense* and *time* ere anticipated results follow. In what way will these be made good to him who begins in 1882, upon a farm wholly devoid of shelter, and valued then at $5,000?

SECOND YEAR.

AGRICULTURAL CHEMISTRY.

Examiner: J. HOYES PANTON, M.A.

1. Name the Principal Metamorphic rocks which have contributed to the soils of Ontario, the sources from which they have been derived, and the agencies by which they have been distributed.

EASTER EXAMINATIONS, 1882.—Continued.

2. State the principles upon which the rotation of crops depends. What information has been gathered from the investigation of Lawes upon this method of cultivation?

3. Write brief notes upon *potash* and *lime* as manures.

4. Compare the selling price with the estimated value of a fertilizer of which the following is the analysis:

Moisture	8.05.	Selling price $45 per ton.
Organic matter	30.23.	
Sol. phos. acid	4.57.	
Reverted phos. acid	1.70.	
Insol. " "	3.77.	
Sulphate of Lime	21.06.	
Nitrogen	2.59.	
Potash	7.31.	

5. Name the different forms in which nitrogen occurs in fertilizers, and state their comparative values.

6. Explain the terms, *nutritive, ratio, digestion co-efficient, ration* and *feeding standard.*

(a) Examine the following daily ration for a milch cow weighing 1,500 pounds:

15 lbs. clover hay.
15 lbs. barley straw.
35 lbs. potatoes.
5 lbs. wheat bran.

(b) How much digestible material can an ox obtain from 24 lbs. of a fodder of the following composition:

Inorganic substance	22.2.
" Water	16.0.
" Ash	6.2.
Albuminoids	14.4.
Crude fibre	33.0.
Carbohydrates	27.9.
Fat	2.5.

Give the "nutritive ratio" of this fodder.

7. Give notes upon the practical importance of a knowledge of the analysis of the ash of plants, and the scientific valuation of fertilizers.

8. Name the different classes of experiments which have occupied the attention of the experiment stations in Germany, with reference to the feeding of animals.

SECOND YEAR.

METEOROLOGY.

Examiner: J. Hoyes Panton, M.A.

1. Explain what is meant by "correction for gravitation" in the barometers What standard is adopted.

2. Describe how the so called storm maps are constructed, and state how they may be of use.

3. Describe a *minimum* thermometer, and reduce 48 degrees F. to C., and—40 degrees C. to F.

EASTER EXAMINATIONS, 1882.—Continued.

4. Explain the absence of trees on prairie lands, and the presence of belts of trees along the rivers.

5. How do you account for the intense cold of districts in the vicinity of lakes, while inland localities at a lower temperature appear much warmer?

6. What are meant by the terms *isothermal*, *isochimenal*, and *isotheral*? Illustrate by an example their use in determining the climate of a place.

7. Give notes on rainfall, with special reference to its measurement and effects upon the vegetation of a district.

8. What instrument is used for determining the direction, rate and force of the wind? Describe it.

9. Summarize the following observations:

		Bar.	Max. T	Min. T.	Ther.	Rain	Snow.
1.	7 a.m.	28.146	—— degrees.	—— degrees.	24.6 degrees.	2.16	6.8
	2 p.m.	29.368	—— "	—— "	44.3 "	——	——
	9 p.m.	29.144	45.6 "	8.6 "	28.7 "	——	——
2.	7 a.m.	29.432	—— "	—— "	−5.8 "	——	2.1
	2 p.m.	28.816	—— "	—— "	6.4 "	——	——
	9 p.m.	30.412	26.4 "	−8.7 "	−7.2 "	——	——
3.	7 a.m.	28.004	—— "	—— "	43.2 "	1.68	——
	2 p.m.	28.134	—— "	—— "	49.4 "	——	——
	9 p.m.	28.026	41.2 "	28.6 "	56.3 "	——	——
4.	7 a.m.	29.168	—— "	—— "	24.8 "	——	3.6
	2 p.m.	28.796	—— "	—— "	13.6 "	——	——
	9 p.m.	29.104	24.2 "	−9.6 "	−4.2 "	——	——

SECOND YEAR.

ENTOMOLOGY.

Examiner: J. PLAYFAIR McMURRICH, M.A.

1. Describe the transformation of insects. Classify the various orders according as their transformation is complete or incomplete.

2. Describe the alimentary system of a beetle.

3. Give the characters of the order Lepidoptera.

4. To what order do the following insects belong:—Cochineal insect, currant borer, wire-worm, cut-worm, Hessian fly, bark louse, pear slug, gooseberry fruit worm, June bug, currant measuring-worm.

5. Give the life history of the gooseberry saw-fly (Nematus ventricosus), and mention remedies for its destruction.

6. Describe the larva and image of Macrosila quinque-maculata. How is it kept in check?

7. Give remedies to prevent the destruction of wheat by the midge (Cecidomyia tritici).

8. Describe the appearance and life history of Aspidiotus conchiformis. What means may be employed for its destruction?

9. Mention the principal insects that affect the currant and gooseberry, stating to which order each belongs.

10. Identify the forms placed before you, and state what plants they affect, and the nature of their injury.

EASTER EXAMINATIONS, 1882.—Continued.

SECOND YEAR.

HORTICULTURE.

Examiner: JAMES FORSYTH.

1. Describe the two usual methods of heating horticultural structures. State the temperature required, and how it is regulated.

2. Make a selection of 10 good bedding plants, give the generic name and natural order of each.

3. Make a selection of 6 plants suitable for window culture, giving the technical and common name of each.

4. Explain the process of fertilization in flowering plants. How it is brought about in nature?

5. How are flowering plants hybridized artificially, and for what purpose is it done?

6. How are special varieties of the following fruits perpetuated:—*Apples, plums, gooseberries?*

7. What is understood by monœcious and diœcious plants? Give an example of each.

8. Give the natural orders of the following genera:—Eupatorium, abutilon, calla, dianthus, eucalyptus, and poinsettia.

9. Describe a soil suitable for potting a large number of greenhouse plants.

10. Name four of the insect pests that usually attack greenhouse plants, and state how they may be destroyed.

11. Give a general description of the construction and management of hot beds, and state the principal advantages to be derived from them.

12. Identify the specimens before you, stating the common name, scientific name, and order of each.

SECOND YEAR.

HIPPOPATHOLOGY.

Examiner: E. A. A. GRANGE, V.S.

1. Describe the causes, symptoms, and terminations of Inflammation.
2. Name the diseases of bone.
3. Describe the various kinds of fracture, and treatment of the same.
4. Describe the different kinds of wounds, and various modes of healing.
5. Name the natural causes, symptoms and treatment of Epizootic cellulitis (pinkeye).
6. Name the natural causes, symptoms and treatment of Laminitis (founder).
7. " " " " " **Spasmodic colic.**
8. " " " " " **Tetanus (lock jaw).**
9. " " " " " **Lymphangitis (weed).**
10. " " " " " **Catarrh.**

EASTER EXAMINATIONS, 1882.—Continued.

SECOND YEAR.

BOVINE PATHOLOGY.

Examiner: E. A. A. Grange, V.S.

1. Describe the nature, causes, symptoms and treatment of Hoven.
2. " " " " " Impaction of the rumen.
3. " " " " " Foul in the foot.
4. " " " " " Tuberculosus.
5. " " " " " Foot and mouth disease.
6. " " " " " Choking.
7. " " " " " Pneumonia.
8. " " " " " Sturdy in sheep.
9. " " " " " Foot rot.
10. " " " " " Hoose in calves.

SECOND YEAR.

ENGLISH LITERATURE.

SHAKESPEARE'S "JULIUS CÆSAR" AND "RICHARD II."

Examiner: W. Tytler, B.A.

A. "Julius Cæsar"—Act II., Sc. I.

Brutus—Give me your hands all over, one by one,
Cassius—And let us swear our resolution.
Brutus—No, not on oath: if not the face of men,
The sufferance of our souls, the time's abuse,—
If these be motives weak, break off betimes,
And every man hence to his idle bed;
So let high-sighted tyranny range on
Till each man drop by lottery. But if these,
As I am sure they do, bear fire enough
To kindle cowards, and to steal with valour
The melting spirits of women, then, countrymen,
What need we any spur but our own cause,
To prick us to redress? What other bond
Than secret Romans that have spoke the word
And will not palter? and what other oath
Than honesty to honesty engaged
That this shall be, or we will fall for it?
Swear priests and cowards and men cautelous,
Old feeble carrions, and such suffering souls
That welcome wrongs.

1. When, where, and under what circumstances were these words spoken?

2. *Your hands* (l. 1)—Mention their names. Meaning of "*all over*"?

3. *If not, &c.* (l. 3)—What does "not" modify? Explain fully what is meant by each of the three "motives" mentioned here.

EASTER EXAMINATIONS, 1882.—Continued.

3. What is the meaning of "high-sighted tyranny" (l. 7).—"range" (l. 7)—"drop by lottery" (l. 8)—"fire enough" (l. 9)—"to steel" (l.10)—"redress" (l.13)—"secret Romans" (l. 14)—"palter" (l.15)—"cautelous" (l.18)—"carrions" (l. 19).

5. *Shall be......will fall* (l. 17)—What is the meaning of these auxiliaries?

6. *Line 18*—Why are "priests and cowards" specially mentioned by Brutus in this connection?

7. Give a brief account of the events of Act V.

8. State briefly the substance of Anthony's speech over Cæsar's body.

9. What is the source of Shakespeare's Julius Cæsar?

B. "King Richard II"—Act i., Sc. iii.

Bolingbroke—O, who can hold a fire in his hand
By thinking on the frosty Caucasus?
Or cloy the hungry edge of appetite
By bare imagination of a feast?
Or wallow naked in December snow
By thinking on fantastic summer's heat?
O, no! the apprehension of the good
Gives but the greater feeling to the worse;
Fell sorrow's tooth doth never rankle more
Than when it bites, but lanceth not the sore.
Gaunt—Come, come, my son, I'll bring thee on thy way.
Had I thy youth and cause, I would not stay.

1. *Lines 1 to* 6—What kind of questions? To what are they equivalent?

2. To whose argument is this speech (lines 1 to 10) a reply? What were the arguments?

3. Meaning of "cloy" (l. 3)—"fantastic" (l. 6)—"apprehension" (l. 7)—"felt" (l. 9)—"bring" (l. 11).

4. Explain "bites, but lanceth not" (l. 10).

5. *I would not stay* (l. 12)—Where?

6. Point out any peculiarities of metre, and any rhetorical figures in the extract.

7. Outline briefly that portion of English History included in this play.

8 Classify Shakespeare's plays, and give two examples of each class.

SECOND YEAR.

ENGLISH COMPOSITION.

Examiner: JAS. MILLS, M.A.

Write a composition on one of the following subjects:—

(a) The theatre.

(b) The pleasures of a well-spent life.

(c) Farmers' homes—what they are and what they might be.

(d) Friendly to the best pursuits of man,
Friendly to thought, to virtue, and to peace.
Domestic life in rural leisure spent!—*Cowper.*

EASTER EXAMINATIONS, 1882.—Continued.

(*e*) Lowliness is young Ambition's ladder,
Whereunto the climber—upward turns his face;
But when he once attains the utmost round,
He then unto the ladder turns his back,
Looks in the clouds, scorning the base degrees
By which he did ascend.—*Shakespeare.*

SECOND YEAR.

POLITICAL ECONOMY.

Examiner: JAMES MILLS, M.A.

1. State the objects aimed at in the study of Political Economy, and name the leading divisions of the subject.

2. Explain the nature and origin of capital, and write explanatory notes on the several requisites of production.

3. "People ought to spend money freely in order to encourage trade." Point out the fallacy in this statement.

4. Write a short article on the *division of labour* as a means of increasing production; show its bearing on trade, and its relation to the tariff of a country.

5. What is profit? What other factors enter into the price of products.

6. Account for the real or apparent disproportion which so often exists between *wages paid* and *work done.*

(*a*) What are the most effective means of increasing wages?

7. State clearly the difference between *value* and *price.*

8. Discuss—

(*a*) The English and Canadian systems of land tenure.
(*b*) Credit cycles as set forth in the following table.

YEARS.

1	2	3	4	5	6	7	8	9	10
Depressed Trade.			Healthy Trade.			Excited Trade.		Bubbles.	Collapse.

(*c*) The relative advantages and disadvantages of direct and indirect taxation.
(*d*) The Canadian tariff.

SECOND YEAR.

STATICS.

Examiner: W. NATTRESS, M.B.

1. Name the different ways in which *force* may be exerted.

2. What is the difference between *gravity* and *weight*? Is the weight of a given substance variable? Explain.

EASTER EXAMINATIONS, 1882.—Continued.

3. What must be the condition in order that—
   (*a*) Two forces acting on a body may keep it at rest?
   (*b*) Three forces acting on a body may keep it at rest?

Two forces of 9 lbs. and 12 lbs. respectively, act on a particle at right angles to each other. Find the magnitude and direction of the resultant.

4. What is the *moment* of a force? State the *principle of moments.*

A uniform rod, a foot of which weighs 3 lbs., rests on a fulcrum two feet from one end. What weight suspended from that end will keep it horizontal, when the pressure on the falcrum is 300 lbs.?

5. Define the terms *stable, unstable,* and *neutral* equilibrium. Give familiar examples.

6. What are the qualities of a good balance? Define the *common* or Roman steelyard and show how to graduate it.

7. If the radius of the axle be 5 in. and that of the wheel 30 in., what power will be required to raise a bucket of clay, weighing 200 lbs., from the bottom of a well 40 feet deep?

8. Draw a diagram of the *second system of pulleys* having three pulleys in the lower block. State the relation of P. to W. in this system.

9. Draw a diagram of the *Force pump.*

SECOND YEAR.

DRAINING AND LEVELLING.

Examiner: W. Nattress, M.B.

1. A farmer has two sod fields which lie side by side, and present the same appearance as regards slope, elevation, and kind of soil. One, however, has surface drains only, while the other, in addition to these, is thoroughly undrained. For the ensuing season he prepares both fields for a crop of peas. State in contrast the *appearance* and *conditions* of the soil in these fields from the middle of March to the beginning of June during average spring weather,

2. The following is an extract from the Commission Report of 1881:—"In the township of T. G. very little underdraining has been done, *as it is not required.*" Granting this to be true, describe that township with reference to—
   (*a*) Its general contour.
   (*b*) The kinds of soils.

3. Show by plan how you would underdrain Field No. 17, O. E. F.

4. State concisely, assigning your reasons, which of the two following systems of underdraining you would prefer:
   (*a*) Drains 4 ft. deep and 30 ft. apart.
   (*b*) Drains 3 ft. 6 in. deep and 20 feet apart.

5. Name in order of merit the various materials *now* used for underdrains.

6. From the following data, required the height of point A above E, and their distance apart:

Distance of Station—

No. 1,	from	A 210	from	B 215	Back sight	3.5	Fore sight	2.4
" 2,	"	B 350	"	C 340	"	4.3	"	3.2
" 3,	"	C 500	"	D 520	"	2.7	"	8.5
" 4,	"	D 980	"	E 1150	"	7.4	"	9.6

II. PAPERS SET AT THE SESSIONAL EXAMINATIONS, JUNE, 1882.

FIRST YEAR.

AGRICULTURE.

Examiner: W. Brown.

1. Describe the accompanying sample of wheat as regards purity, plumpness, colour, and milling properties, and indicate, with reasons, to what class it belongs.

2. What regulates the quanties of seeding per acre with cereals?

3. Describe the best method of making and preserving farm-yard manure.

4. Give a full description of the work generally required to start a crop of turnips.

5. Make a list of the green fodder crops grown here, in the order of their earliness, giving the quantities in tons usually obtained per season.

6. What is meant by main, lateral, sub-lateral, herring-bone, and sole, in under-drainage?

7. Give seven of the principal points in favour of drainage, and indicate under what circumstances it does damage.

8. Why does Arboriculture require to be studied as a Science and Art in Ontario?

FIRST YEAR.

GEOLOGY.

Examiner: R. B. Hare, Ph.Dr.

1. What relations do Physics, Chemistry, Meteorology, Botany, and Zoology bear to Geology?

2. Distinguish between Crystalline Rocks and Fragmental,
   (i.) In regard to structure.
   (ii.) In regard to mode of formation.

3. What is the *mineralogical* and *chemical* composition of Granite, Syenite, Mica Schist, Hornblendic Schist, Porphyry, and Argillyte?
   (i.) How does *Metamorphic Granite* differ from *Igneous Granite*?
   (ii.) Distinguish between "Common Ponphyry" and "Quartz Ponphyry."
   (iii.) Define "*Schist*" and distinguish it from Slate and Shale.

4. Define the terms: Stratification, layer, stratum, seam, formation, fault, outcrop, dip, strike, and denudation.
   (i.) What are the chief denuding agents?
   (ii.) What necessary relation subsists between the strike and dip of inclined strata?

5. Where and under what geological circumstances do iron, lead and copper ores, auriferous mispickel and apatites occur in Ontario?

6. Name and sketch the geological formations of the "Erie and Huron District" of Ontario.
   (i.) Describe the rocks and fossils of one of them.
   (ii.) In which is the "Oil District Situated?"

7. Why are *coal beds* found in New Brunswick, Nova Scotia, and the North-West Territory, and not in Ontario? Is all the coal of the Dominion of Canada of the same age?

8. Where in Ontario is the *occurrence* of Calciferous, Chazy, Trenton, Utica, Medina, and Clinton Strata characteristics?

9. Name and briefly describe the minerals, rocks and fossils before you.

MIDSUMMER EXAMINATIONS, 1882.—Continued.

FIRST YEAR.

STRUCTURAL AND PHYSIOLOCICAL BOTANY.

Examiner: J. PLAYFAIR MCMURRICH, M.A.

1. Name some of the substances which may be found in a vegetable cell, giving a short description of each.

2. Describe a typical fibro-vascular bundle. Compare the stem of a succulent plant as regards the arrangement of its bundles with that of a tree.

3. What are the various modes of branching? How is its regularity interfered with?

4. Explain the following terms:—*(a)* diœcious, *(b)* monodelphous, *(c)* Raceme, *(d)* anatropous, *(e)* dimorphism.

5. Describe the structure of an ovule, and the process of fertilization.

6. Classify fleshy fruits, give an example of each variety.

7. Name the more important inorganic proximate principles found in plants, stating in each case the source from which they are derived.

8. Describe briefly the process of assimilation in plants.

9. What is meant by metastasis? Give an example.

10. Describe briefly the influence of light on plants.

FIRST YEAR.

MATERIA MEDICA.

Examiner: F. C. GRENSIDE, V. S.

1. Give the different forms in which medicines are administrated to the domesticated animals.

2. Define the terms Ecbolic, Antiseptic, Disinfectant, Sedative, and Aphrodisiac.

3. Give the preparation of Fleming's Tincture of Aconite.

4. Give the actions of Aconite, and mention in what stages of diseases it is used.

5. Give the action of Aloes, and mention dose for each action for horse.

6. In what diseases and condition of the horse is Aloes Contra-indicated?

7. Mention the use, and dose of Areca Nut for dog.

8. What action has Belladonna on the pupil of the eye?

9. Mention the actions of Arsenic given internally, and give dose of Fowler's Solution for horse.

10. By what other name is Liquor Ammoniæ Acetatis spoken of, and mention actions and dose for horses and cattle.

FIRST YEAR.

ENGLISH LITERATURE.

"MARMION."

Examiner: W. NATTRESS, M.B.

1. When was "Marmion" written? Give a brief outline of the whole story, with a detailed account of the incidents which occur in Canto V.

MIDSUMMER EXAMINATIONS, 1882.—Continued.

2. Briefly sketch Sir Walter Scott's life, and draw an outline map showing his different places of abode.

3. State the causes of the war which terminated in "Flodden Field." Name the different divisions of the Scottish army, and quote or give a synopsis of Scott's description of the Highlander.

4. Critics acknowledged this poem to be—

(a) irregular *(b)* affected *(c)* inaccurate and *(d)* that the character of the hero is unsuited to the age in which he is placed.

Sustain these indictments by quotations, by illustrations, or by argument.

5.

"At night, in secret, there they came,
The Palmer and the holy dame.
The moon among the clouds rose high,
And all the city hum was by.
Upon the street where late before
Did din of war and warriors roar,
You might have heard a pebble fall,
A beetle hum, a cricket sing,
An owlet flap his boding wing
On Gile's steeple tall.

* * * * *

A solemn scene the Abbess chose;
A solemn hour her secret to disclose.

* * * * *

'Now, saintly Palmer, mark my prayer:
I give this packet to thy care,
For thee to stop they will not dare;
And, oh! with cautious speed,
To Wolseley's hand the papers bring,
That he may show them to the king;
And, for thy well-earned meed,
Thou holy man, at Whitby's shrine
A weekly mass shall still be thine,
While priests can sing and read—
What ails't thou?—Speak!' For as he took
The charge a strong emotion shook
His frame; and ere reply,
They heard a faint, yet shrilly tone
Like distant clarion feebly blown,
That on the breeze did die,
And loud the Abbess shrieked in fear,
'Saint Withold, save us?—What is here?
Look at yon City Cross?
See on its battled tower appear
Phantoms, that scutcheons seem to rear,
And blazoned banner toss.'"

(a) Write brief notes on the "The Palmer," "The Abbess." "Wolsey," "Saint Withold," "City Cross."

(b) "I give this packet to thy care." What packet?

(c) Explain the vision cited above, and contrast the use of the supernatural made by Shakespeare in "Macbeth" with this.

MIDSUMMER EXAMINATIONS, 1882.—Continued.

(*d*) Scan, naming the metre in each case—

"A solemn hour her secret to disclose."
"What ails't thou? Speak!—For as he took."
"Look at yon City Cross."

(*e*) Point out and name the figures of speech in the extracts. An example of anachronism occurs in the above. Explain.

(*f*) "You might have heard a pebble fall."

Why so quiet?

6. "But scarce three miles the band *had rode*
When o'er a height they passed.
And *sudden* close before them showed
His towers *Tantallon* vast."

(*a*) Point out and name the figures of *euphony*, of *syntax*, and of *rhetoric* which occur in this extract.

(*b*) Describe Tantallon Castle.

(*c*) Parse the italicised words.

7. Explain the allusions in the following passages:
(*a*) "The cloth-yard arrows flew like hail."
(*b*) "The trusty blade Toledo right."
(*c*) "And did a vestal vot'ress there."
(*d*) "St. Antony fire thee."

8. "So boldy he entered the Netherby Hall
Among brides-men and kinsmen and brother, and all."

Complete the quotation of this and the two following stanzas.

9. To what characteristics is the popularity of Scott due?

FIRST YEAR.

ENGLISH COMPOSITION.

Examiner: JAS. MILLS, M. A.

1. Give rules for the use of the Period and the Colon.
2. Punctuate the following sentences:

(*a*) Cato being next called on by the counsel for his opinion delivered the following forcible speech

Conscript fathers I perceive that those who have spoken before me &c

(*b*) Lord Beacon has summed up the whole matter in the following words A little philosophy inclineth mens minds to atheism but depth in philosophy bringeth mens minds to religion.

(*c*) You have friends to cheer you on you have books and teachers to aid you but after all the proper education of your own mind must be your own work.

3. Write a composition on one of the following subjects:

(1) Honour.

(2) The company one keeps.

(3) The habit of smoking.

MIDSUMMER EXAMINATIONS, 1882.—Continued.

(4) "Full many a gem, of purest ray serene,
The dark unfathomed caves of ocean bear;
Full many a flower is born to blush unseen,
And waste its sweetness on the desert air."

FIRST YEAR.

MENSURATION.

Examiner: W. Nattress, M. B.

1. What is the difference between the area of an equilateral triangle whose side is 8 ft., and that of another triangle whose sides are 7, 8 and 9 feet respectively?

2. Find the area of a square field whose diagonal is 10 chains. Divide this field into three equal areas by lines parallel with the diagonal.

3. An oblong field whose sides are as 1 : 2 has a perimeter of 60 chains. Find its area.

4. What do you mean by the *pitch* of a roof? Describe the *common or true pitch*, the *Gothic pitch*, and the *pediment pitch*.

How many bundles of shingles laid 5 in. to the weather will be required for a barn 50 × 90 common pitch?

5. Find the solidity of a log 40 feet long, the diameter of the ends being 4 and 3 ft. respectively. What is the largest square stick which can be hewn out of this log?

6. A cylindrical pail is 14 in. in diameter and 14 in. in height. How often can it be filled with water from a vat, shaped like the fustrum of a cone, whose depth is 10 ft., and area of its ends 30 ft. and 48 ft. respectively?

7. Which will hold more water, a cylindrical cistern 8 ft. in diameter or two similar ones each 5 ft. in diameter?

8. Find the area of a regular heptagon whose side is 6 ft. Apothem whose side is 1 = 1.0382607.

SECOND YEAR.

AGRICULTURE.

Examiner: W. Brown.

1. On a 400 acre farm in Ontario, under mixed farming, by a seven shift, where cattle and sheep are kept, give the kind and probable produce of each crop annually, specifying what extra crops should be grown for special purposes in connection with first-class management of live stock.

2. Grazing is an art under the best practice. As such, show in what way it should be followed on this farm under its present conditions. Specify particulars.

3. The practice of bare summer fallowing has its advocates and opponents. Give the arguments on each side.

4. Wool as an annual crop in connection with mixed farming in Ontario is changing. What are these changes, the causes for the same, and show to what extent they affect the revenue from 100 acres, on an average?

5. What is farming—theoretically, scientifically and practically? Give an example of their combination.

MIDSUMMER EXAMINATIONS, 1882.—Continued.

SECOND YEAR.

LIVE STOCK.

Examiner: W. Brown.

1. The relative profits of breeding, rearing and feeding cattle and sheep are regulated by various circumstances. What are these as applicable to Ontario?

2. The value of wool for certain manufactures depends upon length, texture, spirals, and serrations. Give, as nearly as possible, in order of latter property, the twelve wools grown by us this year, and opposite the names place indications of the three others.

3. The prematuring of beef is a controverted point as against its slower production. Show in juxtaposition the points affecting the question that arises in the breeding of a Shorthorn Grade from birth to two and three years old respectively.

4. Take Shorthorn and Galloway Grade Steers, trace the following process of each up to $2\frac{1}{2}$ years, and submit a balance sheet.

5. What is Live Stock raising in these times in Ontario?

SECOND YEAR.

ANALYTICAL CHEMISTRY.

Examiner: R. B. Hare, Ph.Dr.

Part.—Lecture Room, Time $1\frac{1}{2}$ hours.

1. Distinguish Gravimetric Analysis from Volumetric. When is Organic Analysis "*Ultimate*," and when "*Proximate*"?

2. Define the terms: *tests, reagents* and *reactions*. How do the operations of analysis *in the dry way* differ from those *in the wet way*?

3. How is the *Specific Gravity* of a liquid determined—

   (i.) by means of the specific gravity bottle or piknometer;
   (ii.) by means of the areometer or hydrometer?

3. Define "Atomicity" and "Basicity," illustrating each by Formulæ with brief explanations. Is atomicity a fixed property or is it variable.

5. Give a list of the "*Group Reagents*," and describe briefly the conditions connected with their use.

   (i.) Explain by formulæ the action of *Yellow Ammonium Sulphide* upon the sulphides of the metals of the *Second Group*.

   (ii.) How would you in solution distinguish a ferrous salt from a ferric, a mercurous from a mercuric?

   (iii.) Under the conditions of the Third Group, why is ammonic chloride added before ammonic hydrate?

6. How would you analyse *Shell-marl*?

Part II.—Laboratory. Time $1\frac{1}{2}$ hours.

1. Determine the metals and acids present in solution No. 1 *(a), (b), (c).*

2. Prove the presence of iron in solution No. 2. Give specific tests to prove the form.

3. Prove the presence of Mercury in solution No. 3. Give specific tests to prove the form.

MIDSUMMER EXAMINATIONS, 1882.—Continued.

SECOND YEAR.

SYSTEMATIC AND ECONOMIC BOTANY.

Examiner: J. Playfair McMurrich, M.A.

1. Give a general classification of the Phanerogamia, stating briefly the characters of each group.

2. Describe the life history of the rust fungus (Puccinia graminis).

3. Describe the process of reproduction in ferns. Mention some of the commoner native varieties.

4. Mention the characteristics of the order Palmacæ. Give some of the more important economic plants of the order, stating the use to which each is put.

5. Name the orders and genera from which our common spices are obtained.

6. Name the order and genera, other than the Gramineæ, used for forage.

7. What are the characteristics of the order Compositæ? Mention six common members of the order.

8. Identify the plants before you.

9. Analyze and identify the plant given you.

SECOND YEAR.

MATERIA MEDICA.

Examiner: F. C. Grenside, V.S.

1. Give dose of Nux Vomica for horse, and mention its principal alkaloid.

2. To what constituent does Oak Bark owe its astringency? Give uses of the bark for cattle and sheep.

3. From what species of plant is Opium obtained, and what is its most important Alkaloid?

4. How much Opium does Laudanum contain? Give dose for horses cattle, sheep, and pigs.

5. Mention actions, uses, and doses of Nitrate of Potash for horses and cattle.

6. In what diseases is Chlorate of Potash of special value?

7. What is the most powerful Sedative known?

8. Of what especial use are Stavesacre Seeds? Give the preparation for that purpose.

9. Mention the different kinds of Turpentine.

10. Give a perscription for Tympanitis in cattle.

SECOND YEAR.

MILTON.

"L'ALLEGRO," AND "IL PENSEROSO."

Examiner: S. C. Smoke, B.A.

(a) "Haste thee, nymph, and bring with thee
Jest and youthful jollity,
Quips and cranks and wanton wiles,
Nods and becks and wreathed smiles
Such as hang on Hebe's cheek,
And love to live in dimple sleek;
Sport, that wrinkled care derides,
And laughter holding both his sides."

MIDSUMMER EXAMINATIONS, 1882.—*Continued.*

(*b*) "But let my due feet never fail
To walk the studious cloisters pale,
And love the high embowed roof,
With antic pillars, massy proof,
And storied windows richly dight
Casting a dim religious light."

1. *Nymph.* Who is meant? Give other names and epithets by which she is designated in this poem.

2. Explain the construction of *thee* (after *haste*), *nymph*, *as*, *care*, *Laughter.*

3. *Laughter......his.* What figure? State on what principles the gender in such cases is determined and exemplify from these poems.

4. Notice variations in the metre of the above extracts.

5. Write a paraphrase of (*b*).

6. *Studious cloisters pale.* What other reading? Point out the difference in meaning between the two.

7. Quote from these poems passages in which occur the following words: *Fantastic*, *cynosure*, *bout*, *demure.*

8. Give derivation of *quip*, *dimple*, *daisy*, *cynosure*, *jocund*, *counterfeit*, *trophy*, *cloister*, *anthem*, *ecstasy.*

9. Give meaning of *yclep'd*, *dight*, *matin*, *learned sock*, *bestead*, *commercing*, *garish.*

10. "To behold the wandering moon
Riding near her highest noon."

Derive *noon* and show how it obtained the meaning which it has in this passage.

11. Derive the terms L'Allegro and Il Penseroso, and give their meaning. Remark upon the form of the latter.

12. Quote the two closing lines of each of these two poems.

13. Name the poems of Milton in the order in which they were written.

14. Taine says: "Milton was not born for the drama but for the ode." Explain this statement and give your opinion as to its correctness.

SECOND YEAR.

BOOK-KEEPING.

Examiner: W. Nattress, M.B.

1. In Farm Book-keeping, what are the several accounts which you think necessary to keep with reference to—

(*a*) the farm proper;
(*b*) the household?

2. Bought a thoroughbred Hereford cow. Specify the various items to be recorded in making this entry in your books.

3. Enumerate the different ways in which the debit side of the following accounts may be affected:

(*a*) Live Stock Account.
(*b*) Field Account.
(*c*) Real Estate Account.

4. Enter the following transactions:

(*a*) Purchased a seed drill for \$80—one half cash, the remainder on my note for 60 days.

(*b*) Imported ten Leicester ewes. Cost price, £2 10s. each (£1 sterling = $\$4.86\frac{2}{3}$). Freight and other charges, \$50.

MIDSUMMER EXAMINATIONS, 1882.—Continued.

(c) One week after landing, four of the animals died.

(d) Selected 100 young maples from the bush, and planted them along the front of the farm. Trees worth $12\frac{1}{2}$ cents each. Cost of labour $10.

(e) Sold for cash from Field No. 6, 400 bush. of barley, at 75c. per bush.

5. Write out a form of the note No 4 *(a)*. A "Bill of Exchange" on the Bank of England for payment of sheep in No. 4 *(b)*. A cheque on the Bank of Commerce for $250.

6. Name the various "Instruments" relating to farm property, which should be recorded at the "Registry Office" of the County. What are your privileges with reference to the searching of titles to lands? State fees.

7. Define *Lease*, *Deed*, *Mortgage*.

In what way may the principal secured by a mortgage become due before the expiration of the time for which the mortgage is drawn?

SECOND YEAR.

LAND SURVEYING.

Examiner: W. NATTRESS, M.B.

1. Give a full description of Gunter's chain, and construct a table containing inches, links, chains and acres.

2. Describe a cross staff, an offset staff, a picket, a field-book, and explain the use of the Theodolite.

3. Assuming the accompanying plan to be drawn on a scale of 20 chains to the inch, find the area of *(a)* the whole block of land lying North-East of the Brock Road, *(b)* the Government land only in the same block.

4. Illustrate by rough plan how you would survey Field No. 10 to ascertain its area, and to show the size and position of the two "breaks" as shown in the accompanying plan.

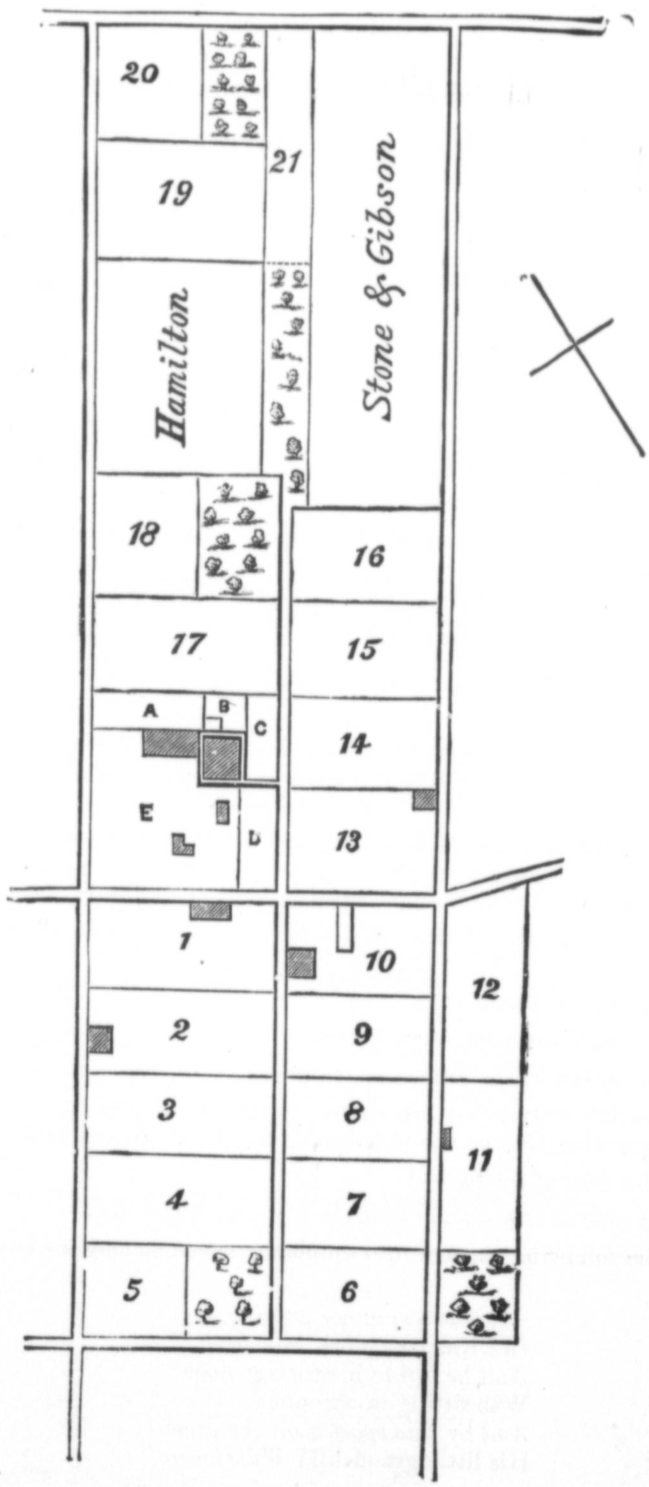
5. Plan the field from the adjoining field-book, scale 2 chains to the inch.

L OFFSET.	CHAIN LINES.	R OFFSET.
to corner of field 400	900 to (3) on lane	200 to ditch.
	800	150 to ditch.
	650	100 to ditch.
to fence 600	600	
	500	150 to ditch.
	From (1) North.	
o river 300	400 to (2)	
o river 100	250	
	From (1) West.	

6. Make a rough sketch of the field ABCDE, and calculate its area from the accompanying field-book.

L OFFSET.	CHAIN LINES.	R OFFSET.
to D 960	1300 to O E	
	360	
	From O C	
to B 350	1650 to O C	
	1200	
	400	390 to E
	From O A East.	

MIDSUMMER EXAMINATIONS, 1882.—Continued.



III. PAPERS SET AT THE MATRICULATION EXAMINATIONS, OCTOBER, 1882.

ARITHMETIC.

Examiner: W. Nattress, M.B.

1. What is the cost of paving a court-yard 250 ft. long by 120 ft. wide at $12\frac{1}{2}$c. per square yard?

2. Find the difference in acres between a square mile of land and a piece of land a mile square.

3. How many square yards are there in $\frac{1}{5}$ of a square mile?

4. Find the G. C. M. and L. C. M. of 1260, 18584 and 12960.

5. Reduce $\frac{2\frac{1}{2}-5\text{-}6}{2\frac{1}{2}+5\text{-}6}+\frac{7}{12}\text{of}\,\frac{90}{42}-\frac{22\frac{1}{2}}{30}$ to a simple fraction, and convert .00728 into an equivalent vulgar fraction.

6. How many planks 15 ft. long and 10 in. wide will be required to construct a platform 50 yds. long and 42 ft. broad?

7. A man realizes for his property in England £4000 (£1 sterling = $\$4.86\frac{1}{2}$). It costs him $\frac{1}{40}$ of this for travelling expenses in going from England to Canada. He then invests $\frac{1}{8}$ of the remainder in farm stock, $1\frac{1}{12}$ in household goods, and the remainder in Ontario land at $75 per acre. How much land can he buy?

ENGLISH GRAMMAR.

Examiner: James Mills, M.A.

1. Define the terms, *number*, *case*, *voice*, and *syntax*.

2. State the different modes of indicating gender in English, and give an example of each.

   (*a*) Give the feminine terms corresponding to *monk*, *earl*, *marquis*, *executor*.

3. Write out the plural of *cup-ful*, *aid-de-camp*, *mussulman*, *analysis*, *grotto*, and *Mr.*

4. Decline *I*, *she*, and *who*.

5. Conjugate *shall* and *will* interrogatively.

6. Correct mistakes in the following sentences:

   (*a*) The doctor said that fever always produced thirst.
   (*b*) As neither George nor Alexander are going, let you and I go.
   (*c*) Who does it belong to?
   (*d*) He rode to town, and drove six cows, on horseback.

7. Divide the following passage into simple sentences, stating the kind and connection of each:

> "It was a summer *evening*.
> Old Kasper's work *was done*,
> And he *before* his cottage door
> Was sitting in the sun,
> *And* by him *sported* on the green
> His little grandchild *Wilhelmine*."

(*a*) Parse the Italicised words.

MATRICULATION EXAMINATIONS, 1882.—Continued.

GEOGRAPHY.

Examiner : J. Playfair McMurrich, M.A.

1. What is meant by a river-basin? Draw a map of North America, showing the basins of the large rivers.

2. Where are the following towns, and for what are they noted :—Leeds, Dresden, Simla, Xerxes, Lyons?

3. In what Counties of Ontario are the following towns :—Goderich, Cornwall, Sandwich, Kingston and Belleville?

4. State accurately the boundaries of the Province of Quebec as it now stands.

5. Name the principal rivers of New Brunswick, giving the chief towns on their banks.

6. What and where are the following :—Hindoo-Koosh, Volga, Colombo, Heligoland, Mareotis, Potomac, Mecca, Anticostic, Bab-el-mandeb, Teneriffe.

COMPOSITION.

Examiner : R. B. Hare, Ph.Dr.

Write a composition on one of the following subjects :—

(a) A description of your home and its surroundings.

(b) A letter to a friend, giving some account of your summer's work and amusements.

(c) The best indication of man's tastes and character is the company he keeps.

DICTATION AND READING.

Examiner : R. B. Hare, Ph.Dr.

Dictation.—Fourth Book, p. 117—"Trees......straight line."
Reading.—Fourth Book, p. 117—"Immediately......can tell."

APPENDIX 4.

ONTARIO AGRICULTURAL COLLEGE.

CLASS LISTS.

I. EASTER EXAMINATIONS, 1882. II. MIDSUMMER EXAMINATIONS, 1882.

I. Easter Examinations, 1882.

FIRST YEAR.

Honours. Classes.	Agriculture.	Live Stock.	Practical Handling and Judging of Cattle.	Practical Handling and Judging of Sheep.	Inorganic Chemistry.
I.	1 McKercher, W. 2 Hopkins, J. A. 3 { Robinson, J.D. Hutton, J. R. 5 Jeffs, H. B. 6 Bowes, J. B.	1 McKercher 2 Robinson 3 { DeVeber Jeffs 5 { Bowes, J B Clark, C. Torrance 8 { Hopkins Hutton, J.R. Eidt Willis Minard Magor 14 Raikes	1 Torrance 2 { Stevenson Fotheringham 4 Thomas	1 Strange 2 Garland	1 Hutton, J. R. 2 McKercher 3 { Lough Greenlaw
II.	1 Clark, C. 2 Raikes, H. 3 { Eidt, W. Minard, W. 5 Frith, H. 6 Magor, J. F. 7 Creelman, J. A. 8 Greenlaw, F. W. 9 Perry, D. E. 10 { Garland, C. S. Dickinson, G. A. 12 Willis, W. B. 13 { Lough, W. H. Cutting, A. N. McLennan, D. Smith, F. W. Newport, E. F.	1 { Dickinson Broughton M'Pherson Lough 5 { Smith, F. W. Fothering-ham 7 { Thomas Begg Smith, J A 10 { Gillespie Cutting Greenlaw 13 Newport 14 { Robertson Perry Bowes, J. C. McKim McNish 19 { Raynes Creelman Frith 22 { Gregory Riddell Garland Maunsell McLennan 27 Messecar 28 Carnegie 29 Pope, A. H.	1 { Hutton, W. E. McNish Perry 4 { Touran-geau Bowes, J.B. Hopkins McKim McKercher 9 { Smith, F.W. Luton Eidt Hutton, J.R. 13 Raikes 14 { Strange Jeffs Cowley 17 { Riddell Greenlaw Robinson Willis Dickinson 22 { Carnegie Gillespie Neilson 25 { Minard Lough Robertson McPherson Holcroft Gregory Rowes, J.C. Maunsell 33 { Magor Smith, J.A. Ryall Creelman Schwartz McLennan	1 { Clark, F. Greenlaw 3 { Bowes, J. B. Jeffs 5 Hopkins 6 { Carnegie Fothering-ham Gregory McNish Robinson 11 { Creelman Bowes, J.C. Smith, F.W. Hutton, W. E. Hutton, J R McPherson Raikes Torrance 19 Stevenson 20 { Perry McKercher Thomas Frith Tourangeau Messecar 26 { Neilson Newport Minard 29 { Eidt Robertson Morton Luton DeVeber Ord McLennan Maunsell Broughton	1 { Hopkins Thomas 3 { Gregory Hutton, W. E. 5 Minard 6 { Perry Major 8 { Dickinson Clark, F.

Pass. III.	1	Strange, A. W.	1	Strange	1	Pope, A. H.	1	Jones	1	McPherson	
		Hutton, W. E.		Holcroft		Newport		Gillespie		Jeffs	
		Joseph, S. S.	3	Smith, J. L.		Garland		McKim	3	Joseph	
	4	Smith, J. A.	4	Gilpin, R. R.		DeVeber		Pope, A. H.	4	Willis	
	5	Torrance, W. J.	5	King		Clark, C.		Willis	5	Raikes	
		Major, C. H.		Edmondson		Clark, F.	6	Holcroft		Fotheringham	
	7	Gilpin, R. R.	7	Morton		Raynes		Ffolkes		McNish	
	8	DeVeber, W. H.		Clark, F.		Messecar	8	Edmondson	8	King	
	9	Robertson, W.		Hutton, W. E.	9	Ffolkes		Rose		Robertson	
	10	Begg, R. A.		Major		Jones		Smith, J. A.	10	Stevenson	
	11	McPherson, D.	11	Kestell		Kestell	12	Riddell		Maughan	
		McKim, J. A.		Neilson		Frith		Magor		Bowes, J. C.	
		King, J. E.		Stevenson		Morton		Begg		Schwartz	
	14	Thomas, F. J.	14	Rose	14	Smith, J. L.	15	Raynes		Strange	
	15	Stevenson, C. R.		Ord		King		Schwartz	15	Tourangeau	
		Jones, W. S.		Luton	16	Major		Clark, C.		Creelman	
	17	Ord, W.	17	Cowley		Cutting	18	Major		Bowes, J. B.	
	18	Holcroft, H. S.		Fraser	18	Rose				Clark, C.	
		Edmondson, J. A.	19	Law				Ryall		Morton	
		Fotheringham, W.		Havard		Maughan		Lough		Ryall	
		Carnegie, J. H.		Jones		Broughton		Cutting		Torrance	
		Clark, F.		Ffolkes		Fraser		Fraser		Garland	
		Broughton, C. J.		Tourangeau		Gilpin, R. R.		Kestell		DeVeber	
		Gregory, J.				Havard		Dickinson		Smith, J. A.	Kestell
	25	Maunsell, G. S.		Schwartz		Law		Smith, J. L.		Newport	Raynes
		Kestell, R. H.		Maughan		Ord		Gilpin		Frith	Gillespie
		Bowes, J. C.		Ryall		Begg		Havard		Robinson	Ord
	28	Messecar, C. L.				Edmondson		Cowley		Neilson	Begg
	29	Raynes, G. S.						King		Eidt	Cutting
	30	McNish, C. N.								Carnegie	McLennan
	31	Riddell, A. A.								Edmondson	Rose
		Morton, S. G.								Holcroft	Magor
	33	Fraser, T. A.								Smith, J. L.	Gilpin, R. R.
		Smith, J. L.								Broughton	Jones
		Neilson, J.								Cowley	Havard
		Cowley, E. A.								McKim	Smith, F. W.
		Maughan, W. E.								Maunsell	Messecar
	38	Tourangeau, A.								Law	Riddell
		Law, F. J.									
		Havard, B. T.									
		Schwartz, J. A.									
		Gillespie, J. H.									
		Rose, G. M. Ryall, F.									

☞ Names unnumbered are those of students who have failed to pass in the subject.
The minimum for first-class honours is 75 per cent. ; for second-class honours, 50 per cent. ; for pass, 33 per cent.

Class Lists: Easter, 1882.

FIRST YEAR—*Continued.*

Classes.		Organic Chemistry.	Zoology.	Veterinary Anatomy.	English Literature.	English Composition.
Honours.	I.	1 Hutton 2 Hopkins 3 { Perry 3 { Minard 5 Thomas	1 Thomas 2 Bowes, J. C. 3 Hutton, J. R.	1 McKercher 2 Thomas 3 Hutton, J. R. 4 Raikes 5 Ord 6 Lough	1 { Clark, F. 1 { Fotheringham 3 Raikes 4 Hutton, J. R.	1 Greenlaw 2 Hutton, J. R. 3 McKercher 4 Fotheringham
	II.	1 { McKercher 1 { Torrance 1 { Hutton, W. E. 1 { Willis 5 Greenlaw 6 { Strange 6 { Maunsell 8 Bowes, J. C. 9 Robertson 10 Dickinson 11 Lough	1 Fotheringham 2 Perry 3 { Robertson 3 { Hopkins 5 Stevenson 6 McKercher 7 Strange 8 Hutton, W. E. 9 Creelman 10 { Lough 10 { DeVeber 12 Garland 13 Major 14 Torrance 15 Bowes, J. B. 16 Willis	1 Jeffs 2 Greenlaw 3 Torrance 4 Perry 5 Minard 6 Hutton, W. E. 7 Maunsell 8 Cutting 9 { McLennan, J. 9 { Neilson 11 Robertson 12 { Clark, F. 12 { Morton 12 { Clark, C.	1 Thomas 2 Bowes, J. C. 3 Robertson 4 Hopkins 5 Major 6 Perry 7 McKercher 8 Willis 9 Joseph 10 Ryall 11 Greenlaw 12 Maunsell 13 Minard 14 Torrance	1 Major 2 Lough 3 Minard 4 Gregory 5 Willis 6 Thomas 7 Hutton, W. E. 8 Hopkins 9 Clark, F. 10 Robertson 11 Raikes 12 Bowes, J. C.
Pass.	III.	1 Gregory 2 McNish 3 Clark, F. 4 { Stevenson 4 { Clark, C. 4 { Schwartz 7 Raikes	1 { Maunsell 1 { McNish 1 { Maughan 1 { Clark, C. 5 Jeffs 6 Neilson 7 Dickinson	1 Willis 2 Maughan 3 McNish 4 { Major 4 { Gregory 6 { Fotheringham 6 { Dickinson	1 { McPherson 1 { Maughan 1 { Hutton, W. E. 1 { Newport 5 Lough 6 Edmondson 7 Stevenson	1 { Perry 1 { Torrance 1 { DeVeber 4 Law 5 Garland 6 Bowes, J. B. 7 Maunsell

Pass.					
III.	7 Jeffs	8 Clark, F.	6 Schwartz	8 Jeffs	8 Clark, C.
	9 McPherson	9 Raikes	Broughton	9 King	Creelman
	King	10 Schwartz	Strange	10 Robinson	Ryall
	Garland	Smith, J. L.	Stevenson	Magor	11 Cutting
	Fotheringham	12 Holcroft	Hopkins	12 Bowes, J. B.	12 Maughan
	13 Bowes, J. B.	13 Newport	Garland	Dickinson	Stevenson
	Tourangeau	14 Edmondson	Bowes, J. B.	Pope	Schwartz
	Deber	15 Greenlaw	Messecar	Gregory	15 Broughton
	Kestell	McKim	Bowes, J. C.	16 McNish	16 Kestell
	Maughan	17 Ryall	17 McPherson	Strange	McPherson
	Neilson	18 Eidt	18 Raynes	Garland	Ord
	Ryan	Minard	Riddell	Schwartz	Raynes
	Smith, J. L.	20 McPherson	Tourangeau	20 Cutting	20 Dickinson
	Creelman	Gregory	Smith, F. W.	McKim	Newport
	Carnegie	22 Rose	22 King	Clark, C.	Magor
	Magor	23 Smith, J. A.	Holcroft	23 Creelman	Joseph
	Robinson	King	DeVeber	DeVeber	Smith, F. W.
	Frith	25 Raynes	Law	Kestell	Jeffs
	Raynes	Carnegie	26 Joseph	Holcroft	McNish
	McKim	Tourangeau	Creelman	Smith, J. L.	Strange
	Edmondson	Robinson	Ryall	Cowley	Frith
	Ord	Cowley	Edmondson	Smith, J. A.	Begg
	Gillespie	Morton	Eidt	Carnegie	Eidt
	Eidt	Cutting	Kestell	31 Morton	Neilson
	Cowley	Ord	Begg	32 Neilson	Smith, J. L.
	Law	Begg	Rose	Tourangeau	Cowley
	Holcroft	Gillespie	Carnegie	McDonald	King
	Newport	Kestell	Magor	Raynes	Gilpin, R. R.
	Rose	Jones	Gillespie	Law	Robinson
	Riddell	Messecar	Newport	Eidt	Rose
	Smith, F. W.	Smith, F. W.	Smith, J. L.	Ord	Edmondson
	Jones	Broughton	McKim	Broughton	Holcroft
	McLennan	Fraser	Robinson	Gillespie	McKim
	Gilpin, R. R.	Gilpin, R. R.	Frith	Gilpin	Jones
	Broughton	Havard	Cowley	Smith, J. A.	Tourangeau
	Cutting	McLennan	Smith, J. A.	Begg	Morton
	Havard	Riddell	Jones	Jones	Fraser
	Begg	Magor	Gilpin, R. R.	Frith	Smith, J. A.
	Fraser		Fraser	Riddell	Messecar
	Smith, J. A.		Havard	Messecar	Gillespie
	Morton			Havard	McLennan
				Fraser	Carnegie
				McLennan	Havard

☞ Names unnumbered are those of students who have failed to pass in the subject.
The minimum for first-class honors is 75 per cent.; for second class honors, 50 per cent.; for pass, 33 per cent.

Class Lists: Easter, 1882.

FIRST YEAR—*Continued.*

Classes.		Arithmetic.	General Proficiency.
Honours.	I.	1 McKercher 1 Bowes, J. C. 3 Hutton, J. R. 4 Hopkins 4 Minard 6 Clark, F. 7 Willis 7 McPherson 9 Robertson 10 Stevenson	1 Hutton, J. R. 2 McKercher, W. 3 Hopkins, J. A. 3 Thomas, F. J. ....
Honours.	II.	1 Fotheringham 2 Gregory 3 Jeffs 4 Rose 5 McNish 6 Dickinso 7 Raikes 8 Gillespie 8 Creelman 8 Torrance 11 Perry 12 Thomas 13 Robinson 14 Hutton, W. E. 14 McDonald 14 Maughan 17 Ryall	1 Minard, W. F. 2 Greenlaw, F. W. C. 3 Perry, D. E. 4 Raikes, H. 5 Torrance, W. 6 Jeffs, H. B. 7 Willis, W. B. 8 Hutton, W. E. 9 Fotheringham, W. 10 Bowes, J. C. 11 Robertson, W. 12 Clark, F. 13 Strange, A. W. 14 Gregory, J. ....
Pass.	III.	1 Smith, J. A. 1 Greenlaw 3 Lough 4 Maunsell 4 Strange 4 Carnegie 7 Joseph 8 Schwartz 9 Broughton 10 Thomas 11 Newport 12 Magor 13 McKim 14 Cowley 14 Smith, J. L. 16 Garland 16 Smith, F. W. 18 Clark, C. 18 Frith 18 Eidt 18 King 18 Morton 18 Kestell 18 Begg 25 Tourangeau	1 McPherson, D. 2 McNish, C. H. 3 Stevenson, C. R. 4 Clark, C. 5 Bowes, J. B. 6 Garland, C. S. ....

Departments.		FIRST CLASS MEN IN THE DEPARTMENTS.
I.	Agriculture and Live Stock.	1 Kercher, W.
II.	Natural Science.	1 Hutton, J. R. 2 Hopkins, J. A.
III.	Veterinary Science.	1 McKercher, W. 2 Thomas, F. J. 3 Hutton, J. R. 4 Raikes, H. 5 Ord, W. 6 Lough, W. H.
IV.	English Literature and Composition.	1 Fotheringham, W. 2 Hutton, J. R.

CLASS LISTS: EASTER, 1882.

FIRST YEAR—*Continued.*

Classes.		Arithmetic.	General Proficiency.	Depart-ments.		FIRST CLASS MEN IN THE DEPARTMENTS.
Pass.	III.	Edmondson	....	V.	Mathematics.	1 { McKercher, W.
		Messecar	....			{ Bowes, J. C.
		Holcroft	....			3 Hutton, J. R.
		Fraser	....			4 { Hopkins, J. A.
		DeVeber	....			{ Minard, W. F.
		Major	....			6 Clark, F.
		Raynes	....			7 { Willis, W. B.
		Pope	....			{ McPherson, D.
		Law	....			9 Robertson, W.
		Ord	....			10 Stevenson, C. R.
		Cutting	....			
		Jones	....			
		Gilpin	....			
		McLennan	....			
		Neilson	....			
		Havard	....			

☞ Names unnumbered are those of students who have failed to pass in the subject.

Only those who pass in every subject are ranked in general proficiency.

First-class men in general proficiency must obtain at least 67 per cent. of the total number of marks; second-class men, at least 50 per cent. of the total number of marks. First-class men in any department must obtain at least 75 per cent. of the marks allotted to the subjects in that department.

CLASS LISTS: EASTER, 1882.

SECOND YEAR.

Classes.		Agriculture.	Arboriculture.	Live Stock.	Practical Handling and Judging of Cattle.	Practical Handling and Judging of Sheep.
Honours.	I.	1 Howitt, W. 1 Shuttleworth, A. 3 Wettlaufer, F. 4 Stover, W. J.	1 Howitt 2 Shuttleworth 3 Wettlaufer 4 Chase 5 Dawson 6 Philbin 6 Shearer 6 Ramsay 6 Williams	1 Howitt 2 Ramsay	1 Howitt 2 Wettlaufer	1 Dawson 2 Howitt ....
	II.	1 Bignell, E. 2 Philbin, T. R. 3 Duthie, J. 4 Barclay, E. H. 5 Ramsay, R. A. 6 Bowman, B. 7 Chase, O. 8 White, W. G. 9 Blanchard, M. G. 10 Dennis, J. 10 Bethune, K. 12 Dawson, J. 12 Williams, A. W. 14 Goold, G. E. 15 Elworthy, R. H. 15 Shearer, E.	1 Bignell 1 Stover 3 Mahony 4 White, W. G, 4 White, C. D. 6 Dennis 6 Elworthy 8 Bowman 8 Duthie 10 Barclay 10 Hallesy 12 Silverthorne 13 Goold 14 Gilpin 15 Bethune	1 Chase 2 Blanchard 3 Shuttleworth 3 Wettlaufer 5 Silverthorne 6 Stover 7 White, C. D. 8 Bowman 9 Bethune 10 Duthie 10 Mahony 10 Williams 13 Hallesy 13 Barclay 15 White, W. G. 16 Pope, E. 17 Dawson 17 Dennis	1 Stover 2 Barclay 3 Blanchard 4 Shuttleworth 4 Duthie 4 Ramsay 7 Hallesy 8 Bowman 9 Philbin 10 Shearer 11 Dawson 11 Chase 13 Mahony 13 Silverthorne 13 Bignell 13 Gilpin 17 Dennis 18 Pope, E. 18 White, W. G. 20 Williams 20 Elworthy 22 Goold.	1 Barclay 2 Duthie 3 White, W. G. 4 Wettlaufer 4 Stover 6 Shuttleworth 6 Chase 8 Bignell 9 Bowman 9 Blanchard 11 Gilpin 12 Philbin 13 Ramsay 14 Silverthorne 15 Shearer 16 Hallesy 16 Williams ....
Pass.	III.	1 Hallesy, F. 2 Gilpin, W. 3 Silverthorne, N. 4 Pope, E. 5 White, C. D. 6 Mahony, E. C.	Pope, E. Blanchard.	1 Goold 1 Gilpin 3 Philbin 4 Bignell 5 Shearer 5 Elworthy	1 Bethune 2 White, C. D.	1 Mahony 2 Goold 2 Pope, E. 4 White, C. D. 5 Bethune 5 Dennis 7 Elworthy.

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CLASS LIST: EASTER, 1882.

SECOND YEAR—*Continued.*

Class.		Agricultural Chemistry.	Meteorology.	Entomology.	Horticulture.	Bovine Pathology.
Honors.	I.	1 Howitt	1 Howitt 2 Wettlaufer 3 Chase	1 Howitt 2 Stover	1 Wettlaufer 2 Howitt	1 Wettlaufer 2 Howitt 3 Shuttleworth 4 Ramsay 5 Blanchard
	II.	1 Stover 2 Wettlaufer 3 Shuttleworth 4 Chase 5 { Ramsay { Dennis 7 Philbin 8 Shearer 9 Bignell	1 Bignell 2 Shuttleworth 3 Ramsay 4 Dennis 5 Stover 6 Barclay 7 Gilpin 8 Williams 9 Shearer	1 Shuttleworth 2 Whettlaufer 3 Silverthorne 4 Chase 5 Bignell 6 Ramsay 7 Mahony	1 { Stover { Shuttleworth 3 { Ramsay { Bignell 5 White, W. G. 6 Chase 7 Silverthorne 8 Blanchard 9 Elworthy 10 { Bowman { White, C. D.	1 Philbin 2 Chase 3 Bethune 4 Stover 5 Dawson 6 { Mahony { White, C. D. 8 Duthie 9 Barclay 10 Silverthorne 11 Dennis 12 { Gilpin { Bignell 14 Hallesy 15 White, W. G.
Pass.	III.	1 White, C. D. 2 { Bowman { Barclay 4 White, W. G. 5 { Williams { Blanchard 7 Silverthorne 8 Bethune 9 Gilpin 10 { Dawson { Elworthy 12 Mahony 13 Hallesy 14 Goold 15 Duthie 16 Pope, E.	1 White, W. G. 2 Bowman 3 Mahony 4 Elworthy 5 White, C. D. 6 Bethune 7 Silverthorne 8 Hallesy 9 Goold 10 Duthie 11 Dawson 12 Blanchard Philbin Pope, E.	1 Bowman 2 Hallesy 3 Dawson 4 Shearer 5 White, C. D. 6 Dennis 7 Bethune Williams White, W. G. Gilpin Elworthy Duthie Goold Pope, E. Barclay Philbin Blanchard	1 Dennis 2 Gilpin 3 Mahony 4 Bethune 5 Shearer 6 Dawson Williams Pope, E. Duthie Goold Hallesy Philbin Barclay	1 { Williams { Elworthy 3 Bowman 4 Goold 5 Shearer 6 Pope, E. ....

☞ Names unnumbered are those of Students who have failed to pass in the subject.
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Class Lists: Easter, 1882.

SECOND YEAR—*Continued.*

Classes.		Hippopathology.	Handling and Judging of Horses.	English Literature.	English Composition.	Political Econom[y].
Honours.	I.	1 Howitt 2 Wettlaufer 3 Ramsay 4 Chase 5 Shuttleworth 6 Blanchard	1 Howitt 2 Shuttleworth 3 Stover 4 Blanchard	1 Howitt 2 Barclay 3 Philbin	1 Barclay 2 Howitt	1 Howitt
	II.	1 Williams 2 Stover 3 Philbin 4 Barclay 5 Gilpin 6 Bowman 7 Dennis 8 { Bethune 8 { Bignell 10 Silverthorne 11 White, C. D. 12 Shearer 13 White, W G 14 { Duthie 14 { Elworthy	1 Ramsay 2 Wettlaufer 3 Dennis 4 Silverthorne 5 Barclay 6 Philbin 7 Bethune 8 Williams 9 Duthie 10 Chase	1 Hallesy 2 { Stover 2 { Wettlaufer 4 Ramsay 5 Silverthorne 6 Bowman 7 Chase 8 Bethune 9 Shuttleworth 10 White, C. D. 11 Dennis 12 White, W. G.	1 Shuttleworth 2 White, W. G. 3 Philbin 4 Elworthy 5 Wettlaufer 6 Ramsay 7 Stover	1 Wettlaufer 2 Shuttleworth 3 Philbin 4 Ramsay 5 Stover 6 Bignell 7 Chase
Pass.	III.	1 { Pope, E. 1 { Dawson 1 { Mahony 1 { Hallesy 5 Goold	1 Elworthy 2 Shearer 3 Mahony 4 White, W. G. 5 { Bowman 5 { Bignell 5 { Gilpin 8 Pope, E. 9 Dawson 10 Hallesy White, C. D. Goold	1 Bignell 2 Dawson 3 Mahony 4 Elworthy 5 Duthie 6 { Shearer 6 { Tronson Gilpin Williams Goold Blanchard Pope, E.	1 Dennis 2 Blanchard 3 Hallesy 4 Elworthy 5 Chase 6 Dawson 7 White, C. D. 8 Mahony 9 Bowman 10 Silverthorne 11 Bethune 12 Shearer Goold Williams Gilpin Duthie Pope, E.	1 Hallesy 2 Silverthorne 3 Bethune 4 Dennis 5 Gilpin 6 Elworthy 7 Dawson 8 Bowman 9 Mahony 10 Williams 11 White, C. D. 12 Shearer Blanchard White, W. G. Duthie Goold Pope, E. Barclay

☞ Names unnumbered are those of Students who have failed to pass in the subject.
The minimum for first class honours is 75 per cent. ; for second class honours, 50 per cent. ; for pass, 33 per cent.

Class Lists: Easter, 1882.

SECOND YEAR—*Continued.*

Classes.		Statics.	Draining and Levelling.	General Proficiency.
Honours.	I.	1 { Howitt { Wettlaufer	1 { Howitt { Chase 3 Ramsay 4 { Wettlaufer { Shuttleworth 6 { Williams { Bignell 8 Dawson	1 Howitt, W. 2 Wettlaufer, F. 3 Shuttleworth 4 Ramsay, R. A. ....
	II.	1 Blanchard 2 Shuttleworth 3 Stover 4 Ramsay 5 Elworthy 6 Dennis 7 { Bethune { Gilpin	1 Silverthorne 2 Dennis 3 White, W. G. 4 Hallesy 5 { Bowman { Barclay 7 { Duthie { Mahony 9 { Bethune { Elworthy	1 Stover, W. J. 2 Chase, O. 3 Dennis, J. ....
Pass.	III.	1 { Chase { Dawson 3 Philbin 4 Bowman 5 Duthie 6 Hallesy 7 Williams 8 Mahony White, W. G. White, C. D. Silverthorne Bignell Goold Tronson Barclay Shearer	1 Stover 2 Shearer 3 { Philbin { Gilpin 5 White, C. D. 6 Blanchard Goold Pope, E.	1 Bethune, K. 2 Dawson, J. 3 Mahony, E. C. ....

Departments.		First-class Men in the Departments.
I.	Agriculture.	1 Howitt, W. 2 Wettlaufer, F. 3 Shuttleworth, A.
II.	Natural Science.	1 Howitt, W.
III.	Veterinary Science.	1 Howitt, W. 2 Wettlaufer, F. 3 Ramsay, R. A. 4 Shuttleworth, A. 5 Blanchard, M. G.
IV.	English Literature and Political Economy	1 Howitt, W.
V.	Mathematics.	1 Howitt, W. 2 Wettlaufer, F.

☞ Names unnumbered are those of Students who have failed to pass in the subject.
Only those who pass in every subject are ranked in general proficiency.
First-class men in general proficiency must obtain at least 67 per cent. of the total number of marks; second-class men, at least 50 per cent. of the total number of marks. First-class men in any department must obtain at least 75 per cent. of the marks allotted to the subjects in that department.

CLASS LISTS.—*Continued.*

II.—*Midsummer Examinations, 1882.*

FIRST YEAR.

	Classes.	Agriculture.	Geology.	Botany.	Meteria Medica.	English Literature.
Honours.	I.	1 Hutton, J. R. Jeffs, H. B. 3 Creelman, J. A.	1 Hutton, J. R. 2 Robertson 3 Donaldson 4 Stevenson	1 Gregory 2 Slater 3 Hutton, J. R. 4 Willis	1 Robertson Jeffs 3 McNish Santon 5 Slater Neilson 7 Maunsell Homfray 9 Tucker Hutton, J. R. Willis 12 Smith, Lloyd Fotheringham 14 McPherson	1 Hutton, J. R. 2 Slater 3 Willis
	II.	1 Robertson, W. 2 Willis, W. B. 3 Bowes, J. B. Santon, E. A. 5 Fotheringham, W. 6 Hutton, W. E. 7 McPherson, D. Maunsell McNish, C. H. 10 Stevenson, C. R. 11 Harrison, H. O. 12 Major, C. H. F. Kistell, R. H. 14 Mathewson, G. Edmondson, J. A. 16 McLennan, J. D. 17 Donaldson, J. Garland, C. S. Slater, H. 20 Paton, G. C. 21 Neilson, J. 22 Strange, A. W. Boyle, R. (vise) Holcroft, H. S. Greenlaw, F. W.	1 Slater 2 Fotheringham 3 Gregory 4 Austin 5 McPherson 6 Jeffs Neilson 8 Willis 9 Strange 10 Maunsell 11 Garland Santon 13 Joseph	1 Stevenson 2 Jeffs 3 Major 4 Maunsell 5 Donaldson 6 Saxton 7 Paton 8 Joseph Strange Holcroft 11 McPherson 12 Holcroft Robertson 14 Hanson	1 Joseph 2 Edmondson 3 Garland Harrison 5 Ord 6 Rose 7 Edgar Strange 9 Major Weston Gregory Holcroft Donaldson 14 Luton Schwartz Hutton, W. E. 17 Whitehead 18 Bowes Gillespie 20 Greenlaw 21 Torangeau McMartin, A. 23 Stevenson Mathewson Creelman 26 Boyle, R. 27 Eddington 28 Paton Aylsworth Boyle, H. 31 Cowley	1 Joseph 2 Robertson 3 Donaldson 4 Eddington 5 Major 6 Stevenson 7 Tucker 8 Fotheringham 9 Mathewson Paton 11 Boyle, R. 12 Hanson 13 Harrison 14 McPherson 15 Creelman Garland 17 Gregory Homfray 19 Jeffs Strange 21 Greenlaw Raynes 23 DeWinton

Strange, A. W.
22 Boyle, R. (vise)
Holcroft, H. S.
Greenlaw, F. W.

21 McMartin, A.
23 Stevenson
Mathewson
Creelman
26 Boyle, R.

27 Eddington
28 Paton
Aylsworth
Boyle, H.
31 Cowley

21 Greenlaw
Raynes
23 DeWinton

Pass. III.

1 Tourangeau, A.
DeWinton, F. W.
Joseph, S. S.
4 Gillespie, J. H.
Smith, J. L.
6 Raynes, G. S.
7 Edgar, A. E.
Rose, G. M.
9 Hanson, E. F.
Carnagie, J. H.
Austin, W. E.
Cutting, A. H.
Morton, F. G.
14 Boyle, R.
15 Fuller, S. G.
Eddington, D. C.
17 Luton, E.
18 Buckingham, F. W.
Homfray, P.

Aylesworth, H.
Cowley, E. A. E.
Gregory, J.
Lattimer, R.
McMartin, Alex.
McLennan, A.
Pinkey, H. R.
Rhodes, O.
Schwartz, J.
Tucker, H. V.
Whitehead, J.
Weston, G. H.
Jones, Williams A.

1 Rose
2 Major
3 Schwartz
4 Homfray
5 Paton
6 Creelman
McNish
8 Holcroft
9 Smith
10 Edmondson
Tucker
12 Tourangeau
Harrison
14 Hanson
15 Luton
Bowes, J. B.
17 Raynes
Weston
Boyle (Lord)
Mathewson
21 Morton

Boyle, H.
Eddington
Cowley
DeWinton
Greenlaw
Jones, Williams
Carnegie
Fuller
McLennan, A.
Edgar
Rhodes
Buckingham
Lattimer
Gillespie
McMartin
Pinkey
McLennan, J. D.
Hutton, W. E. Ings
Aylsworth Whitehead
Broughton Cutting

1 McNish
Bowes
Fotheringham
4 Garland
5 Schwartz
6 Smith, J. Lloyd
7 Greenland
Ord
9 Mathewson
Neilson
11 Tucker
12 Eddington
13 Creelman
Harrison
15 Edmondson

Morton
Luton
Tourangeau
Raynes
McLennan, D.
Doyle
Gillespie
DeWinton
Whitehead
Fuller
Edgar
McLennan, A.
Pinkey
Carnegie
Lattimer
Cutting
Boyle, H.
McMartin
Hutton, W. E.
Weston
Rose
Cowley
Ings
Austin

1 Morton
2 Fuller
3 Buckingham
4 DeWinton
5 Carnegie
6 McLennan
7 Jones Williams
8 Hanson

Lattimore
McLennan, A.
Rhodes
Pinkey
Ings

1 Neilson
2 Maunsell
3 Austin
4 Edgar
5 Schwartz
6 Broughton
7 Tourangeau
8 Bowes, J. B.
9 Edmondson
10 Smith, J. L.
11 Buckingham
12 Holcroft
13 Carnegie
14 Jones Williams
15 Rose
16 McNish
Aylsworth
18 Ord
Whitehead

Morton
Luton
Boyle, H.
McMartin
Pinkey
Fuller
Cowley
Gillespie
McLennan, A.
Weston
McLennan, J. D.
Cutting
Lattimore
McLennan, D.
Rhodes
Hutton, W. E.
Ings

☞ Names unnumbered are those of Students who failed to pass in the subject.
The minimum for first-class honours is 75 per cent. ; for second-class honours, 50 per cent. ; for pass, 33 per cent.

FIRST YEAR.—*Continued.*

Classes.	English Composition.	Mensuration.	General Proficiency.
Honours. I.	1 Slater 2 Hutton, J. R. 3 Major 4 Donaldson 5 Paton 6 Boyle (Viscount)	1 Slater	1 Hutton 2 Slater 3 Fotheringham 4 Willis ....
Honours. II.	1 Gregory 2 Stevenson 3 Harrison 4 Greenlaw 5 Joseph 6 Creelman 7 Homfray 8 Robertson 9 Mathewson 10 Hawson 11 Frothingham 12 Buckingham	1 Hutton, J. R. 2 Jeffs 3 Whitehead 4 Hanson	1 Jeffs 2 Donaldson 3 Stevenson 4 Joseph 5 Saxton 6 McPherson 7 McNish 8 Creelman 9 Harrison 10 Paton 11 Gregory 12 { Homfray, Neilson, Strange
	1 { McNish, Saxton 3 Eddington 4 Tucker 5 Cowley 6 Strange 7 Jeffs 8 Rose 9 McPherson 10 Broughton 12 { DeWinton, Holcroft 13 Schwartz 14 Maunsell 15 Morton 16 McMartin	1 McVish 2 Willis 3 Creelman 4 Boyle, R. 5 { Gregory, Harrison 7 Robertson 8 Joseph 9 { Donaldson, Hutton, W. E. 11 Stevenson 12 { Strange, Homfray 14 McLennan, D. 15 { Paton, Sauton	1 Bowes 2 Hanson ....

Departments.		First-class Men in the Departments.
I.	Agriculture.	1 { Hutton, J. R., Jeffs 3 Creelman
II.	Natural Science.	1 Hutton, J. R. 2 Slater 3 Gregory

12 { DeWinton { Holcroft 13 Schwartz 14 Maunsell 15 Morton 16 McMartin	11 Stevenson 12 { Strange { Homfray 14 McLennan, D. 15 { Paton { Sauton

Pass.	III.	17 Tourangeau 18 { Bows, J. B. { Cutting 20 { Luton { Neilson { Smith, J. L. Rhodes Edgar Garland Jones, Williams Aylsworth McLennan, J. D. Austin Fuller Weston Pinkey McLennan, A. Latimer Whitehead Carnegie Gillespie Boyle, H Ings (sick)	17 { Rose { McPherson { Gillespie 20 Greenlaw 21 Bowes 22 Neilson 23 Fotheringham Garland Maunsell DeWinton Eddington Saxton Edmondson Luton McMartin Smith, J. L. Boyle, H. Broughton Carnegie Pinkey Aylsworth Morton Mathewson Buckingham Austin Cowley Edgar Fuller Holcroft Jones, Williams Latimer Major McLennan, A. McLennan, J. D. Ord Raynes Rhodes Tourangeau Tucker Weston Cutting Ings (sick)

III.	Veterinary Materia Medica.	1 { Robertson { Jeffs 3 { McNish { Saxton 5 { Slater { Neilson 7 { Maunsell { Homfray 9 { Hutton { Willis 12 { Smith, J. L. { Fotheringham 13 McPherson
IV.	English Literature and Composition.	1 Hutton, J. R. 2 Slater 3 Willis
V.	Mathematics.	1 Slater

☞ Names unnumbered are those of students who have failed to pass in the subjects.
The minimum for first-class honours is 75 per cent.; for second-class honours is 50 per cent.; for pass, 33 per cent.
Only those who pass in every subject are ranked in General Proficiency.

Class Lists: Midsummer, 1882.

SECOND YEAR.

Classes.	Agriculture.	Live Stock.	Judging Cattle and Sheep.	Practical and Analytical Chemistry.	Systematic and Economic Botany.
Honours. I.	1 Shuttleworth, A. Wettlaufer, F. 3 Ramsay, R. A.	1 Shuttleworth 2 Wettlaufer Ramsay 4 Chase	1 Ramsay 2 Shuttleworth 3 Chase	1 Wettlaufer 2 Shuttleworth 3 Torrance	1 Wettlaufer
Honours. II.	1 Chase, O. 2 Torrance, W. J. 3 Silverthorne, N. 4 Mahony, E. C. 5 Dickinson, G. A. 6 Perry, D. E. 7 White, C. D. 8 Dawson, J. J.	1 White, C. D. 2 Gilpin 3 Silverthorne 4 Dawson Perry 6 Newport 7 Torrance 8 Hallesy Clark 10 McDonald 11 DeVeber 12 Dickinson	1 Torrance 2 Wettlaufer 3 White, C. D. 4 Shearer 5 Perry 6 Clark, C. 7 Silverthorne 8 Mahony 9 Hallesy 10 Elworthy 11 McDonald 12 Gilpin 13 McPhail 14 Dawson 15 Thomas 16 Dickinson	1 Thomas 2 Ramsay 3 Perry	1 Chase 2 Thomas 3 Ramsay 4 Elworthy 5 White, C. D. Perry 7 Shuttleworth
Honours. III.	1 McDonald, J. 2 McPhail, E. 3 Smith, J. A. 4 Shearer, E. S. 5 Clark, C. Newport, E. F. Elworthy, R. H. 8 Hallesy, F. 9 Gilpin, W. 10 McKim, J. 11 DeVeber, W. H. 12 Thomas, F. J.	1 Thomas 2 Elworthy 3 Shearer 4 McPhail 5 Smith, J. A. 6 Mahony 7 McKim	1 DeVeber 2 McKim 3 Smith, J. A. 4 Newport	1 Hallesy 2 Dawson 3 Dickinson 4 Silverthorne 5 Chase 6 White 7 Mahony 8 Clark 9 Elworthy 10 Dennis De Veber McPhail Smith, J. A. McDonald McKim Shearer Newport Gilpin	1 Clark 2 Silverthorne 3 Dickinson 4 DeVeber 6 Hallesy 5 Mahony 7 Torrance 8 Shearer 9 Dawson McKim McDonald Smith, J. A. McPhail Gilpin Newport

☞ Names unnumbered are those of Students who failed to pass in the subjects.
The minimum for first-class honours is 75 per cent.; for second-class honours, 50 per cent.; for pass, 33 per cent.

Class Lists: Midsummer, 1882.

SECOND YEAR—*Continued.*

Smith, J. A. McDonald McKim	Shearer Newport Gilpin	McPhail Gilpin Newport

☞ Names unnumbered are those of Students who failed to pass in the subjects.
The minimum for first-class honours is 75 per cent.; for second-class honours, 50 per cent.; for pass, 33 per cent.

Class Lists: Midsummer, 1882.

SECOND YEAR—*Continued.*

Classes.		Horticulture.	Materia Medica.	Judging Horses.	English Literature.	Book-keeping.
Honours.	I.	1 Wettlaufer 2 Shuttleworth	1 Wettlaufer 2 Torrance 3 Ramsay 4 Silverthorne	1 Wettlaufer 2 Shuttleworth	1 Thomas 2 Wettlaufer	1 Chase 2 Wettlaufer 3 Shuttleworth 4 Ramsay
	II.	1 Ramsay 2 Chase 3 Thomas 4 Hallesy 5 Dickinson 6 Perry	1 Dawson 2 Hallesy 3 Mahony 4 Thomas 5 Clark 6 Smith 7 Chase 8 White 9 Gilpin 10 Shuttleworth	1 Ramsay 2 Mahony 3 Chase 4 Elworthy 5 Silverthorne 6 Gilpin 7 Hallesy 8 Dawson	1 Shuttleworth 2 Ramsay 3 Chase 4 Dawson	1 Mahony 2 Perry 3 Silverthorne 4 Elworthy 5 Torrance 6 Dawson 7 McDonald
Pass.	III.	1 DeVeber 2 Mahony 3 { Elworthy McDonald 5 Dawson 6 White, C. D. 7 Shearer 8 { Silverthorne Clark Torrance 11 McKim 12 McPhail 13 Dennis Smith, J. A. Newport Gilpin	1 DeVeber 2 Dickinson 3 Perry 4 Shearer 5 { McKim Elworthy McPhail McDonald Newport	1 White 2 McPhail 3 Shearer	1 Torrance 2 Elworthy 3 Silverthorne 4 { DeVeber Hallesy 6 Perry 7 { Clark Mahony Shearer White, C. Newport McKim Dickinson Smith, J. A. McDonald McPhail Gilpin	1 McKim 2 Shearer 3 Hallesy 4 Dickinson 5 White 6 McPhail 7 Clark 8 DeVeber 9 Smith 10 Thomas 11 Gilpin 12 Newport

☞ Names unnumbered are those of Students who failed to pass in the subject.
The minimum for first-class honours is 75 per cent.; if or second-class honours 50 per cent.; for pass 33 per cent.

Class Lists: Midsummer, 1882.

SECOND YEAR—*Continued.*

Classes.		Land Surveying.	General Proficiency.
Honours.	I.	1 Shuttleworth 2 Chase 3 Wettlaufer	1 Wettlaufer ....
	II.	1 Ramsay 2 McKim 3 McPhail 4 Perry 5 DeVeber 6 Dawson 7 Dickinson 8 Thomas 9 Gilpin 10 Silverthorne 11 Hallesy 12 White	1 Shuttleworth 2 Ramsay 3 Chase 4 Silverthorne 5 Dawson 6 Mahony ....
Pass.	III.	1 Smith 2 Torrance 3 Shearer 4 Mahony 5 Clark 6 Elworthy 7 McDonald 8 Newport	1 Hallesy 2 White 3 Elworthy 4 Shearer 5 McPhail 6 Gilpin ....

Departments.		First-class Men in each Department.
I.	Agriculture.	1 Shuttleworth 2 Wettlaufer 3 Ramsay 4 Chase
	Natural Science.	1 Wettlaufer
III.	Veterinary Science.	1 Wettlaufer 2 Ramsay
IV.	English Literature.	1 Thomas 2 Wettlaufer
V.	Mathematics & Book-keeping.	1 Chase 2 Shuttleworth 3 Wettlaufer

Only those who pass in every subject are ranked in General Proficiency.
First-class men in General Proficiency must obtain 67 per cent. of the total number of marks; Second-class men, 50 per cent.
First-class men in any department must obtain 75 per cent. of the marks allotted to the subjects in that department.

APPENDIX 5.

FINANCIAL TABLES.

1.—Appropriation Expenditure for 1882.

2.—College Revenue for 1882.

3.—College account with Farm and Garden for 1882.

4.—Estimated Expenditure for 1883.

Ontario Agricultural College.

1. APPROPRIATION EXPENDITURE FOR 1882.

	$ c.	$ c.
A.—*Maintenance Account.*		
I.—*Salaries and Wages*	12,108 73	
II.—*Food.*		
Meat, fish and fowl	4,399 81	
Bread and biscuits	1,102 91	
Groceries, butter and fruit	4,256 57	
III.—*Household Expenses.*		
Fuel	2,664 78	
Light	952 75	
Laundry, soap and cleaning	231 45	
Furniture and furnishings	713 27	
Repairs and alterations	597 84	
Women servants' wages	1,728 94	
IV.—*Business Department.*		
Advertising, printing, postage and stationery	797 18	
V.—*Miscellaneous.*		
Maintenance of chemicals	147 65	
Library	75 19	
Unenumerated	887 31	
VI.—*Water for College and Farm* (from city water works)	710 41	
		31,374 79
B.—*Capital Account.*		
I.—Fire proof safe for books, papers, etc	271 00	
		271 00
		31,645 79

2. COLLEGE REVENUE FOR 1882.

	$ c.	$ c.
Tuition fees	3,670 00	
Balances on board accounts	4,936 16	
Supplemental Examinations	31 00	
		8,637 16

3. COLLEGE ACCOUNT WITH FARM AND GARDEN FOR 1882.

	$ c.	$ c.	$ c.
(a) With Farm. Dr.			
To Potatoes ....172 bags ....@	0 85	146 20	
" ....200 "	0 55	110 00	
Turnips............ 24½ "	0 12½	3 31	
Wood		36 00	
Milk........... 3,673 gallons @ 14c. (less cost of milking)...		295 84	
Flour .... 28¼ barrels.......................	5 10	145 05	
Keep of College horse		100 00	
Cartage for College..		30 00	
Carpenter's work		60 00	
			926 40
(b) With Garden. Dr.			
To Apples.... ....: 28 bushels	0 50	14 00	
" .... 25¾ barrels (most of them fallen)	1 30	33 47	
Crab apples.......... ½ bushel.......	0 60	0 30	
Asparagus...........431 bunches.......	0 02	8 62	
" ....400 "	0 01	4 00	
Beets................ 12 bushels	0 40	4 80	
Beans (in pod) .... 10¼ "	1 00	10 25	
Celery...............528 heads..................................	0 05	26 40	
Carrots .... 34½ bushels	0 25	8 62	
Cabbage .... 59¾ dozen	0 40	23 97	
Cauliflower .... 30½ "	0 84	25 64	
Corn .... 26½ "	0 12½	3 31	
Cucumbers .... 9½ "	0 25	2 37	
" (pickling). 17 bushels	2 00	34 00	
Citron....... .... 6½ dozen............................... ..	0 48	3 12	
Currants (red) .. .... 12 quarts	0 07	0 84	
" (white) .... 12 "	0 07	0 84	
" (black).....248 "	0 07	17 36	
Collection of herbs..		2 00	
Gooseberries.........283 quarts	0 04	11 32	
Grapes .... 3½ bushels	2 25	7 87	
Lettuce ....324 heads..................................	0 04	12 96	
Onions .... 21¼ bushels	1 00	21 25	
Parsnips .... 25¼ "	0 35	8 84	
Peas (in pod)......... 16¼ "	0 70	11 38	
Pears .... 7¾ "	1 50	11 98	
Potatoes............. 44 "	0 60	26 40	
" ....100 "	0 40	40 00	
Radishes .... 18 bunches............................ .	0 05	0 90	
Rhubarb........		18 00	
Raspberries... ...... 74 boxes..................................	0 10	7 40	
Spinach .... 25 bushels	0 50	12 50	
Strawberries......... 27 boxes..................................	0 10	2 70	
Squash . ... 19½ dozen..........................	0 25	4 87	
Tomatoes............ 42¾ bushels	0 30	12 86	
			435 14*
Cr.			1,361 54
By Amount deducted from students' board bills for work done in outside departments	....	4,421 68	
			4,421 68
By Balance	....	....	3,020 14

* According to the figures of the gardener, who observed the markets more closely, the amount should be $625.16.

4. ESTIMATED EXPENDITURE FOR 1882.

	Voted for 1882.	Required for 1883.	
I.—College and Boarding-House.	126 Students.	126 Students.	
(a) Salaries and Wages.	$ c.	$ c.	$ c.
President, Resident Master, Professor of English Literature and Political Economy	2,000 00	2,000 00	
Professor of Agriculture and Farm Superintendent	2,000 00	2,000 00	
Professor of Chemistry, Geology and Meteorology; Librarian (formerly boarded and lodged in College)	1,200 00	1,500 00	
Professor of Biology and Horticulture (formerly boarded and lodged in College)	1,000 00	1,300 00	
Professor of Veterinary Science	600 00	600 00	
Mathematical and Assistant Resident Master	750 00	600 00	
Bursar	800 00	800 00	
Physician	300 00	300 00	
Instructor in Drill and Gymnastics	150 00		
Steward, Storekeeper, and Instructor in Drill and Gymnastics	....	500 00	
Matron and Housekeeper	400 00	400 00	
Engineer	600 00	600 00	
Assistant Engineer—six months	198 00	198 00	
Stoker and Night Watchman—six months	120 00	120 00	
Janitor and Messenger ($15 per month)	150 00	180 00	
Temporary assistance	100 00	100 00	
	10,368 00		11,198 00
(b) Expenses of Boarding-House.			
Meat, fish and fowl	4,000 00	4,300 00	
Bread and biscuit	1,500 00	1,500 00	
Groceries, Butter and fruit	4,200 00	4,200 00	
Fuel	2,400 00	2,600 00	
Light	1,000 00	1,000 00	
Laundry, soap and cleaning	300 00	300 00	
Furniture and furnishing	550 00	550 00	
Repairs and alterations	650 00	650 00	
Women servants for boarding-house—cooks, laundresses, etc	1,750 00	1,750 00	
Advertising, printing, postage and stationery	600 00	600 00	
Maintenance of Chemicals	150 00	150 00	
Library (books, papers and periodicals)	200 00	200 00	
Unenumerated	700 00	700 00	
	28,368 00	29,298 00	
Less revenue (fees and ballances on account of board)	8,500 00	9,000 00	
	19,868 00	20,698 00	20,698 00
II.—Experimental Farm.			
Farm Foreman	600 00	600 00	
Garden Foreman	600 00	600 00	
Mechanical Foreman	600 00	600 00	
Experiments (labour, seeds, manures, etc.)	1,500 00	1,500 00	
			3,300 00
	23,168 00	23,598 00	23,998 00

APPENDIX 6.

DESCRIPTION OF BUILDINGS, Etc.

Prepared by the Architect of the Public Works Department, January, 1881.

The farm, containing 550 acres, was purchased from Mr. F. W. Stone, Guelph, in 1873, for the sum of $75,000, and is situated on the Dundas road, about one mile from the City of Guelph.

The buildings have been erected on an elevated portion of the Farm, on the north side of the Dundas road, commanding an extensive view of the surrounding country and the City of Guelph. The principal entrance is from the Dundas road, at the south-west angle of the grounds in front of the buildings, which have been skilfully planted; the hot-houses and horticultural gardens being in the south-east part of the premises, and having a separate entrance on the Dundas road.

The original building, to which additions have been made according to the requirements of the College, as the number of pupils increased, consisted of a stone dwelling-house, 53 feet by 39 feet, with addition in the rear for kitchen, laundry, etc., 60 feet by 24 feet, the whole being two stories in height.

Commodious farm buildings of stone and wood, with enclosed yards, also stone, brick, and wood farm houses, were also on the premises when purchased, and the lots were surrounded by good post and rail fences. The greater portion of the lots were cleared and well cultivated, the remaining portions being wooded and retained for ordinary farm requirements.

The following additions were made from time to time to the original dwelling-house:—Dining, reading, and class-rooms, also a lavatory, laundry, steam-heating apparatus, and apartments for the domestics were constructed in 1873-74, the College having been opened in the latter year. Apartments for twenty-eight pupils were fitted up in the stone farm-house, in the front portion of the grounds. This building was burnt down in February last year, and the walls were so much injured that it has not been reconstructed.

In 1875 a mansard roof was constructed over the front portion, and at a distance of 50 feet on the south-east side, the College authorities erected a building 40 feet by 50 feet, two stories in height, with mansard roof, for lecture and class-rooms.

An addition, 94 feet in length by 50 feet in width, two stories in height, with mansard roof, was made on the north-west side in 1877, affording accomodation for thirty additional pupils, with a new dining-room, also apartments for the Professor of Agriculture. A cheese factory was also erected south of the Dundas road. Further additions were made in 1879 and 1880, consisting of store-rooms, Matron's and domestic apartments, also a larger dining-room, 62 feet by 40 feet, and dormitories for sixty additional pupils, making, in all, apartments for 130 pupils, with larger reading-room and library, baths and wash-rooms, all being heated by steam, on the direct low-pressure principle, by means of coils and radiators; a new boiler-house, 38 feet by 24 feet, containing two large steam boilers, with coal-house attached, having been constructed for the purpose.

Arrangements were made with the City Water Works of Guelph to extend their mains to the buildings during 1881, when water was supplied for the requirements of the College, thereby saving the cost of pumping, and the buildings will be protected from fire by means of hydrants in the grounds, the necessary fire hose and reel having been provided.

The City Gas Company of Guelph extended their mains to the buildings during 1880, and all the apartments were supplied with gas-light. The buildings, now completed, occupy a space of 240 feet in front by 180 feet in depth, and contain a reception-room and office, four large class and lecture-rooms, with dining and reading-rooms, library, domitories for

130 pupils, bath-rooms and lavatories, and apartments for the President, Assistant Master and Bursar; also Matron's and servants' rooms.

The perspective view shown on frontispiece, and the accompanying plans, which have been prepared in the Department, will explain the arrangement, dimensions and relative position of the various apartments, also the external appearance of the building, which now presents more of a public character than might have been expected, considering the basis on which the various superstructures were erected.

Further improvements were made in 1881, to complete the furnishing and other internal arrangements, and render the buildings suitable in all respects for the requirements of the College.

The total cost of land and buildings, furniture, live stock, implements, drainage, etc., to the end of 1880, amounted to $225,889,46.

During 1882, residences were erected near the western portion of the buildings, for the Professor of Agriculture and Bursar, the former containing twelve rooms, and the latter nine rooms, both being of stone and roofed with slate, and supplied with water and gas.

Cottages for the Gardener and Farmer were also erected on the eastern portion of the grounds, containing eight rooms, with wood-sheds, etc.; both having been built of stone and roofed with slate. The water supply was extended to these cottages and to the garden and grounds.

Litographs of the proposed Conservatory and Lecture-room, also of the alterations of the grounds in front of the buildings, as designed by Messrs. Miller and Yates, of Philadelphia, are attached to the Report.

APPENDIX 7.

ACT OF INCORPORATION.

As the Act of Incorporation passed by the Legislative Assembly of the Province of Ontario, on the 11th February, 1880, defines somewhat minutely the work of the College and the Farm, it is here quoted for the information of those who may wish to know the objects for which the Institution is maintained :—

No. 60.] BILL. [1880.

An Act respecting the Agricultural College.

Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows :—

School of Agriculture continued. Site. Name.

1. The School of Agriculture, heretofore established in the county of Wellington, in this Province, for instruction in the theory and practice of agriculture, horticulture and arboriculture, and the conducting of experiments relating thereto, is hereby continued, at its present site, under the name of the "Ontario Agricultural College and Experimental Farm."

Nature of instruction.

2. The said college shall be furnished with all appliances, such as land, buildings, implements, tools and apparatus generally, as may be necessary for theoretical and practical education in agriculture, horticulture and arboriculture, and the course of instruction therein shall be with reference to the following subjects :—

(1) The theory and practice of agriculture ;
(2) The theory and practice of horticulture ;
(3) The theory and practice of arboriculture ;
(4) The elements of the various sciences, especially chemistry (theoretical and practical), applicable to agriculture and horticulture ;
(5) The technical English and mathematical branches requisite for an intelligent and successful performance of the business of agriculture and horticulture ;
(6) The anatomy, physiology, and pathology, of the ordinary farm animals; with the characteristics of the different varieties of each kind ; with the management thereof in the breeding, raising, fattening and marketing of each, and with a knowledge of the cheese and butter factory systems ;
(7) The principles of construction and skilful use of the different varieties of buildings, fences, drainage systems, and other permanent improvements, machinery, implements, tools and appliances necessary in agricultural and horticultural pursuits ;
(8) And such other subjects as will promote a knowledge of the theory and practice of agriculture, horticulture and arboriculture.

Practical education insisted upon.

3. The education and instruction shall be at once theoretical and practical, the former known as a course of study, and the latter as a course of apprenticeship ; and a time, not less than three and not more than five hours daily, on a yearly average, shall be spent in undergoing the latter, and for the en-

couragement of such labours, an allowance in part liquidation of expenses may be made; yet, notwithstanding, the course of apprenticeship may be dispensed with, if a satisfactory examination be previously passed in all the operations therein required.

Nature of experiments.

4. Experiments with the different varieties of cereals, grasses and roots, of trees, plants, shrubs, flowers, and fruits; with different modes of cultivation; with different manures; with the breeding, raising and fattening of animals; with the products of the dairy; and with whatsoever else may be of practical benefit in adding to the knowledge of the facts, principles and laws of the science and art of agriculture, horticulture, and arboriculture under the climatic conditions of this Province, shall be carried out on the experimental farm; and the modes of procedure and results published from time to time.

Publication of procedure and results.

Rules, regulations and curriculum of the college.

5. The government of the college shall be under and according to such rules and regulations as the Lieutenant-Governor in Council may from time to time prescribe; and such rules and regulations shall contain provisions for the standard and mode of admission, the course of study, and apprenticeship in each branch in which instruction is given, and may authorize diplomas, certificates of proficiency, scholarship or other rewards to be given, after examination, in any of such subjects; and may also impose reasonable fees for attendance.

Appointments to be made by the Lieutenant-Governor in Council.

6. The Lieutenant-Governor in Council may from time to time appoint a president and such professors, instructors, officers, assistants and servants as the Lieutenant-Governor in Council may deem necessary for the efficient working of said college, and the promotion of its usefulness, and may pass by-laws regulating and prescribing their respective duties.

Sessions, terms and vacations.

7. There shall be two sessions in each year, and two terms in each session; the winter session shall open on the first day of October, and close on the thirty-first day of March; the summer session shall open on the sixteenth day of April, and close on the thirty-first day of August; and the time between the closing and opening of the respective sessions shall constitute the regular vacations.

Affiliation of the college with the University of Toronto.

8. The Lieutenant-Governor in Council may agree with the University of Toronto for the affiliation of the said college with the said university, but only to the extent of enabling the students of the said college to obtain at the examinations of the said university such rewards, honours, standing, scholarships, diplomas and degrees in agriculture as the said university, under its statutes and the Acts of the Legislature in that behalf, may be allowed to confer.

Museum and laboratory.

9. In connection with the college there shall be a museum of agriculture and horticulture, together with the scientific and technical branches relating thereto, in order to afford aids to practical instruction, and illustrations of the agricultural and horticultural products of the Province; as well as a botanical and chemical laboratory to which vendors of seeds and artificial manures may send such seeds and manures, in order that after the proper inspection and tests their purity and strength may be reported for the benefit and protection of the agricultural community.

Gifts, bequests, etc., to college, museum or laboratory.

10. It shall be lawful for the Lieutenant-Governor in Council on behalf of the Province to accept, hold and enjoy any gifts, bequests, or devises of personal or real property or effects which any person may think fit to make for the purposes of the said college, museum or laboratory.

No religious test or profession required; but all facilities given for acquiring religious training.

11. The Lieutenant-Governor in Council may make such regulations as may be deemed expedient touching the conduct of the students, and their attendance on public worship in their respective churches or other places of religious worship, and respecting their religious instruction by their respective ministers, according to their respective forms of religious faith, and every facility shall be afforded for such purposes.

Reports and returns to the Legislative Assembly.

12. Full reports of the progress of the said college and farm shall be annually returned and submitted to the Legislative Assembly, which reports shall, amongst other things, contain :—

(1) A tabular statement with the name and residence of each student attending in each session of the year, together with the name, residence and occupation of the parent or guardian, the number of classes that each student attended, and his progress and efficiency therein ;

(2) A return of the professors, instructors and assistants, with a summary of the instruction given by each ;

(3) A copy of the examination papers used in the sessional examinations, and the results thereof ;

(4) A summary of the operations in the various departments of the farm ;

(5) A clear and succinct account of the modes of procedure and results of the various experiments carried on during the year ;

(6) A detailed statement of the income and expenditure of the college and farm for the year ;

(7) A copy of all rules and regulations made during the year by the Lieutenant-Governor in Council, regarding the standard and mode of admission, the course of study and the course of apprenticeship ;

(8) A comparative statement showing the progress of the college and farm from year to year.

APPENDIX 8.

CIRCULAR OF THE ONTARIO AGRICULTURAL COLLEGE AND EXPERIMENTAL FARM FOR 1882.

STAFF.

(*a*) *College.*

1. JAMES MILLS, M.A., President, *Professor of English Literature and Political Economy.*
2. WILLIAM BROWN, C.E., P.L.S., *Professor of Agriculture.*
3. R. B. HARE, B.A., Ph.D., *Professor of Chemistry, and Lecturer on Geology and Meteorology.*
4. J. P. PLAYFAIR MCMURRICH, M.A., *Professor of Biology and Horticulture, and Lecturer on English.*
5. F. GRENSIDE, V.S., *Professor of Veterinary Science.*
6. WILLIAM NATTRESS, M.B., First Class A. Provincial Certificate, *Professor of Mathematics and Assistant Resident Master.*

A. T. DEACON, *Bursar.*

(*b*) *Farm.*

1. WILLIAM BROWN, C.E., P.L.S., *Farm Superintendent.*
2. P. J. WOODS, *Farm Foreman.*
3. JAMES FORSYTH, *Foreman of the Horticultural Department.*
4. JAMES MCINTOSH, *Foreman of the Mechanical Department.*

INTRODUCTION.

The Institution, known as the "Ontario Agricultural College and Experimental Farm," is situated about a mile to the South of the City of Guelph, in the centre of an extensive agricultural and noted stock-raising district, readily accessible by rail from all parts of the Province. The Farm consists of 550 acres, about 400 of which are cleared. It is composed of almost every variety of soil, and hence is well suited for the purposes for which it was selected.

Immediately upon taking possession, the Government appointed a commission to enquire and report regarding "the manner of adapting the said farm and management and control thereof to the purpose of a Model and Experimental Farm." A few extracts from the Report of this Provincial Farm Commission will show clearly the basis upon which the Institution is at present established.

"The objects of the Institution should be—First, to give a thorough mastery to the practice and theory of husbandry to young men of the Province engaged in Agricultural or Horticultural pursuits, or intending to engage in such ; and, second, to conduct experiments tending to the solution of questions of material interest to the Agriculturalists of the Province, and publish the results from time to time.

"That the Farm should be separated into five distinct departments, namely :—

"1. Field Department.
"2. Horticultural Department.
"3. Live Stock Department.
"4. Poultry, Bird and Bee Department.
"5. Mechanical Department.

"All permanent improvements on the Farm should be carried out on a gradually developed system, and in such a manner as to exhibit and test the comparative values of the most approved methods of executing the several works; and to test the cost, convenience and durability of the several appliances from time to time recommended for adoption on the farms of the Province."

In order to carry out the suggestions of the Provincial Farm Commission, the Government made such improvements on the residence found on the place as would best utilize it for present purposes. Accommodation was provided for about twenty-five pupils, a Principal and a Rector were appointed, and a Foreman for each of the following departments engaged, viz.:—

1. Farm Department.
2. Live Stock Department.
3. Horticultural Department.
4. Mechanical Department.

Work commenced on a small scale in May, 1874; but, owing to a variety of causes, very little was accomplished the first year and a half. The country was scarcely prepared for such an institution; and some of the first appointments were unfortunate. Hence, for two or three years, it seemed very doubtful whether the College would survive the attacks of its enemies and the mistakes of its friends. At length, however, common sense prevailed, and success was assured.

The College buildings have been altered and enlarged from time to time till they assumed the proportions indicated in the frontispiece of this Report; and many improvements have been made on the Farm. A considerable portion of it has been under-drained, suitable buildings have been provided, and a fair representation of stock secured—seven breeds of cattle, six of sheep, and three of pigs.

TERMS OF ADMISSION.

1. Each candidate must be at least sixteen years of age.
2. He must produce satisfactory certificates—
   (1) As to moral character.
   (2) As to physical health and strength.
   (3) As to the assent of his parents or guardians.
   (4) As to his intention to follow Agriculture or Horticulture as an occupation.
3. He must pass the matriculation examination.
4. If a ratepayer or a *bona fide* resident of the Province of Ontario, he must pay a fee of $25 a year in advance; if not, he must pay a fee of $50 a year in advance.
5. At the commencement of each term, except the Summer Term, he must deposit, in addition to the fee, a certain sum to be applied on his board account for one term in advance—

At the commencement of the Fall Term (1st Oct.)	$20 00
" " " " Winter Term (5th Jan.) ..	20 00
" " " " Spring Term (16th April)..	15 00

At the end of each term, the unexpended balance of the amount deposited for that term, if any, will be refunded to the student or his guardian. The amount to be refunded will, in each case, depend on how *well* and how *regularly* the student works in the outside departments.

MATRICULATION EXAMINATION, CERTIFICATES, ETC.

The subjects for Matriculation are as follows:—

(*a*) Reading, writing and dictation.
(*b*) English Grammar—Parsing and Analysis.
(*c*) Arithmetic—to the end of Simple Proportion.
(*d*) The outlines of General Geography, and the Geography of Canada.

Candidates for admission are required to present themselves for examination on the 17th of April or the 1st of October, at nine a.m. in the Lecture Room of the College.

First, Second and Third Class Teachers; holders of Intermediate Certificates, or Certificates of entrance into the High Schools or Collegiate Institutes of Ontario; Graduates or Undergraduates of any University in Her Majesty's dominions, will be admitted on presentation of certificates or diplomas. Intending students who do not hold any such certificates or diplomas, are advised to pass the examination for admission to some Ontario High School, to save the expense and annoyance of having to return home in case of their failing to pass our Matriculation Examination.

☞ There are no special examinations for those who come late. If candidates present themselves after the regular Matriculation Examinations are over, on the *1st October* and the *16th April*, they cannot be admitted without certificates.

GENERAL RULES.

1.—Students are Required

1. To render cheerful and willing obedience to orders.
2. To conduct themselves in a gentlemanly and orderly manner at all times.
3. To avoid all noisy or boisterous conduct in or about the building.
4. To observe neatness of dress at prayers, meals and lectures, and tidiness in their rooms.

2.—The following Practices are Absolutely Forbidden:—

1. Swearing, improper language, and gambling.
2. Use of intoxicating liquors, cards, or firearms.
3. Use of Tobacco while on detail, in or about the buildings, or in any place except in the smoking room.
4. Entering domestic or private apartments without permission.
5. Absence without leave.
6. Cutting, marking, or in any way defacing the College buildings or furniture.

GENERAL REGULATIONS.

1. All students who reside in the building are under the charge of the President.
2. A register is kept of the attendance of students at prayers, work and lectures.
3. All students must attend prayers regularly, unless exempted from doing so, in consequence of objections raised by their parents or guardians.
4. They are required to attend their respective places of worship every Sabbath forenoon.
5. No student is allowed to leave the Institution during the hours of duty without the permission of the President; nor after seven o'clock in the evening, without the permission of the President or the master in charge *pro tem.*
6. In order that there may be no interference with the regular duties of the Institution, the half of every Saturday is set apart as a holiday for recreation and private business.
7. Students must not invite friends or guests to the dining-hall, or to stay over night in the College, without first obtaining the consent of the President.
8. None but the regular boarders are, under any circumstances, to remain over night in the College without leave from the President.
9. Students are provided with everything in the shape of furniture, bedding, towels, etc., that may be requisite, but each is accountable for every such article placed at his disposal.
10. Every student damaging or breaking anything, is required to report the same, that the value of the repairs may be charged to his account.
11. The morning bell is rung at 6 a.m.; bell for breakfast, at 6:30 a.m.; farm bell, at 7 a.m.; school bell, at 9 a.m.; farm bell, at 12 noon; dinner, at 12:30 p.m.; farm bell,

at 1:30 p.m.; school bell, at 2 p.m.; farm bell, at 5:30 p.m.; school bell, at 7 p.m.; bell for roll-call and evening prayers, at 9 p.m.; lights out at 10 p.m.; doors closed at 10:30 p.m.

12. The President is authorized to make such additional regulations as may seem to him necessary for the discipline of the Institution, and to impose fines and other penalties, for the infraction of rules and regulations.

13. No student whose moral conduct, industrial and intellectual progress is unsatisfactory to the staff, will be allowed to remain at the Institution.

N.B. (1) It is the duty of the President to enforce the above rules and regulations.

(2) A copy of this circular will be sent to every candidate for admission; and an application thereafter will be taken as an agreement on his part to comply with all the above rules, regulations and prohibitions.

(3) In the case of occasional students who are of age and are their own guardians, the President may, if he think proper, relax the rules regarding leave of absence and attendance at church.

RESIDENCE, LABOUR, BOARD, REMUNERATION, ETC.

It is desirable that all students should reside in the building. As, however, the city is distant but a mile and a half, students may board in it and attend lectures.

The number of hours of labour for regular students varies with the season of the year, from three and a half to five hours a day. In the months of July and August, when there are no lectures, the number is nine and a half hours a day.

Board, lodging, and light, with the washing of towels and bed linen, $2.24 to $2.52 a week.

Washing, 30 cents per dozen pieces.

Allowances for labour four to ten cents an hour, according to its value as estimated by the Farm Superintendent and his foremen—in no case to exceed the charges for board and washing.

By this arrangement the cost of education is reduced to a minimum.

(1) The entire cost to an Ontario farmer's son, able and willing, with considerable experience in farm work, is $50 to $70 a year for *board, washing*, and *tuition*.

(2) To an Ontario student without any previous knowledge of farming, $ 60 to $75 a year for *board, washing*, and *tuition*.

(3) To non-residents, $75 to $100 a year for *board, washing*, and *tuition*.

COURSE OF INSTRUCTION.

The instruction given at the Institution is embraced under two heads: a Course of Study and a Course of Apprenticeship.

I.—COURSE OF STUDY.

The course of study is one or two years, and comprises the following subjects:—

First Year.

SUBJECTS:

Agriculture.
Live Stock.
Inorganic Chemistry.
Organic Chemistry.
Veterinary Anatomy.
Veterinary Materia Medica.
Physiology.
Zoology.

Structural and Physiological Botany.
Geology and Physical Geography.
English Literature.
English Composition.
Book-keeping.
Arithmetic.
Mensuration.

Second Year.

SUBJECTS.

Agriculture.	Entomology.
Arboriculture.	Meteorology.
Live Stock.	English Literature.
Agricultural Chemistry.	Political Economy.
Veterinary Pathology.	Book Keeping.
Veterinary Surgery and Practice.	Mechanics.
Systematic and Economic Botany.	Levelling and Surveying.

DEPARTMENTS OF INSTRUCTION.

Department 1.—Agriculture.

Introduction.—*History of Agriculture.*—Ancient mediæval, modern; *Literature*—standard works, reports of societies, periodicals; *Varieties of Farming,*—dairy, stock mixed.

Soils.—Origin, distribution, physical properties, and classification of soils.

Reclamation of Lands.—Forest clearing; stumping, stoning, fallowing, etc.

Preparation of the Land for Crops.—Ordinary operations of tillage—ploughing, harrowing, cultivating, rolling, subsoiling, levelling; general cultivation most appropriate for the various kinds of soil.

Succession of Crops.—Importance and necessity of rotation; principles thereof; rotations suitable for various soils; crops—root, forage, cereal—treated with reference thereto.

Cultivation of Crops.—The various crops; *Cereals*—wheat, oats, barley, etc.; *Leguminous*—peas, beans, etc.; *Roots*—turnips, carrots, potatoes, etc.; *Forage or Herbage*—tares, lucerne, clovers, grasses, flax, hemp—cultivation most appropriate for each; *Seeds*—purchasing, testing, preparing, changing; *sowing*—kind and quantity of seed, method of sowing; *after cultivation, harvesting, consumption,* or preparing for market; cost of production; laying land down to grass; management of grass and pasture land.

Improvement of Soils and Land.—Improvement by thorough ordinary cultivation; subsoiling; *draining*—its value; principles; various methods of draining; cost; *manuring*—farm-yard manuring; application, uses and properties of artificial manures—lime, plaster, salt, bones, superphosphate, nitrate of soda, etc.; green manures.

Breeding, Rearing and Feeding of Animals.—Horses suited for agricultural purposes; various breeds; breeding; feeding and general management; *Cattle*—characteristics of the various breeds—Shorthorns, Herefords, Devons, Ayrshire, etc.; methods of breeding—cross-breeding; in and in breeding; pedigree system; rearing young stock; the fattening process; relation of food to increase; dairy management; butter and cheese management; the factory system; *Sheep*—characteristics of various breeds; long wools, medium wools, short wools; breeding and management of ewe flock; winter and spring feeding; rearing of, lambs; relation of food to increase: wool—texture; quantity and quality; dipping and salving, etc.; *Swine*—characteristics of the various breeds; breeding and management of sows; fattening; relation of food to increase; bacon curing.

Implements of the Farm.—Mechanical principles entering into their construction; ploughs, harrows, cultivators; other tillage implements; sowing machines; grass seed and manure distributors; mowing and reaping machines; hay making and harvesting machines; threshing and dressing machines; barn implements; waggons, sleighs, carts; straw cutters; turnip cutters and pulpers; implements used in stock feeding, etc.

General Economy of the Farm.—Laying out a Farm; formation and management of roads and lanes; *fences*—varieties, position, mode of construction, materials, movable fences; hurdles; *hedges*—varities, methods of planting, after cultivation; *buildings*—dwellings, out-buildings, stables, barns, sheds; principles of construction; plans and specifications.

General Business of the Farm.—Capital necessary—value and price of land, stock, implements and improvements; value of all kinds of labour; making of inventories; keeping of stock and produce registers; *markets*—economical laws regulating them;

customs affecting them; modes of buying and selling; common laws relating to agriculture; relation of agriculture to the other industries.

ARBORICULTURE—Application to the American continent; different kinds of trees; occurrence, habits, uses, values; value of timber as a crop; raising of trees from the seed bed; what part of the country should be planted; planting operations; transplanting large trees; enclosing and draining planted grounds; management of trees with a view to shelter and economy.

MISCELLANEOUS SUBJECTS.

DEPARTMENT 2.—NATURAL SCIENCE.

CHEMICAL PHYSICS—Matter, accessory and essential properties of matter; attraction, various kinds of attraction—cohesion, adhesion, capilliary, electrical and chemical; specific gravity; weights and measures; heat, measurement of heat, thermometers, pyrometers, specific and latent heat; sources, nature and laws of light; spectrum analysis.

INORGANIC CHEMISTRY.—Scope of subject; elementary and compound substances; chemical affinity; symbols; nomenclature; combining proportions by weight and by volume; atomic theory; atomicity of the most important elements; oxygen and hydrogen; water—its nature, functions, decomposition and impurities; nitrogen; the atmosphere—its composition, uses and impurities; ammonia—its sources and uses; nitric acid and its connection with plants; carbon; combustion; carbonic acid and its relation to the animal and the vegetable kingdom; sulphur and its compounds; manufacture and uses of sulphuric acid; phosphorus; phosphoric acid and its importance in agriculture; chlorine—its bleaching properties; bromine: iodine; silicon, &c.

ORGANIC CHEMISTRY.—Construction of organic compounds; alcohols, aldehydes, acids and their derivatives; formic, acetic, oxalic, tartaric, citric, lactic, malic, uric, and tannic acids. Constitution of oils and fats—saponification; sugars; starch, cellulose; albuminoids, or flesh formers, and their allies; essential oils, alkaloids—morphine and quinine; classification of organic compounds.

AGRICULTURAL CHEMISTRY.—Connection between chemistry and agriculture; the various compounds which enter into the composition of bodies of animals; the chemical changes which food undergoes during digestion; chemical changes which occur during the decomposition of the bodies of animals at death; the functions of animals and plants contrasted; food of plants, and whence derived; origin and nature of soils; causes of unproductiveness in soil, and how detected; composition of different plants in relation to the soils upon which they grow; rotation of crops; preservation, development, and renovation of soils; manures classified; the chemical action of manures on different soils; chemical theories in reference to the action of superphosphates, the action of lime in the decomposition of double silicates; feeding of animals; classification of foods; chemical results in the use of different foods; points necessary to be considered in order to obtain the full value of artificial and natural foods.

PRACTICAL AND ANALYTICAL CHEMISTRY.—Chemical manipulation, preparation of common gases and reagents; operations in analysis—solution, filtration, precipitation, evaporation, distillation, sublimation, ignition, and the use of the blow-pipe; testing of substances by reagents; impurities in water; adulterations in foods and artificial manures; injurious substances in soils.

Quantitative analysis of soils, manures, and farm produce.

GEOLOGY.—Connection between geology and agriculture; classification of rocks—their origin and mode of formation, changes which they have undergone after deposition; fossils—their origin, inferences from their presence in rocks; geological periods and the characteristics of each. Geology of Canada, with special reference to the nature and economic value of the rock deposits; glacial period and its influence in the formation of soil. Lectures illustrated by numerous diagrams and specimens.

PHYSICAL GEOGRAPHY.—Scope of the subject—earth's place in space, external and internal conditions, atmosphere, ocean, land; superficial configuration of Ontario; theory of springs; classification of lakes; zones of animal and vegetable life.

METEOROLOGY.—Relation of meteorology to agriculture; composition and movements of the atmosphere; nature and manipulation of the barometer, its importance in forecasting the weather; temperature, description of the various instruments used in its measurement and how to use them; solar and terrestrial radiation; the influence of forests on climate; mists, fogs, clouds, rain, hail, and snow; description of instruments used in measuring rain and snow-fall; velocity and direction of wind, causes affecting climate; influence of climate on vegetation.

STRUCTURAL AND PHYSIOLOGICAL BOTANY.—Internal structure of plants—cells and vessels; structure and development of the external parts of plants—root, stem, leaf, flower, seed, fruit; physiology of the cells and vessels—chlorophyll, starch, gum, sugar, crystals, etc.; movements of fluids in plants, respiration, nutrition, reproduction; hybridization; modes of propagation of *varieties* by grafting, budding, layering, and division; disease of plants—smut, rust, mildew, etc.

SYSTEMATIC AND ECONOMIC BOTANY.—Subject defined; principles considered in the classification of plants—plants classified; orders containing the plants of greatest importance to the agriculturist described; plants classified in regard to their economic value for food, medicine, fabrics, forage, timber, etc. The course illustrated by a large collection of well preserved plants.

ZOOLOGY.—Nature of live; vital force; difference between animals and plants; morphology and physiology; homology and analogy; definition of species; classification; subdivisions of the animal kingdom; character of the classes and most important orders, etc.

ENTOMOLOGY.—Anatomy of insects; geographical distribution and classification of insects; metamorphoses of insects; insects injurious to vegetation, their habits and the best methods of checking and preventing their ravages—all illustrated by a good collection of specimens.

DEPARTMENT 3—VETERINARY SCIENCE.

ANATOMY AND PHYSIOLOGY OF THE DOMESTIC ANIMALS.—Horse, ox, sheep, pig. Osseous system, muscular system, syndesmology, planetar system, odontology, digestive system, circulatory system, respiratory system, urinary system, nervous system, sensitive system, generative system, tegumental system.

VETERINARY PATHOLOGY.—Osseous system—the nature, causes, symptoms, and treatment of the various diseases of bone, as splint, spavin, ringbone, etc.

Muscular System—Nature, causes, symptoms, and treatment of flesh wounds, etc.

Syndesmology—Nature, causes, symptoms, and treatment of bog spavin, curb, and other diseases of joints.

Plantar System—Nature, causes, symptoms, and treatment of corns, sand crack, and other diseases of the foot.

Odontology—Describing the diseases of the teeth; also the mode of determining the age of animals by the same.

Digestive System—Nature, causes, symptoms, and treatment of spasmodic and flatulent colic, inflammation of the bowels, acute indigestion, tympanitis in cattle, impaction of the rumen, and many other common diseases.

Circulatory System—Describing the diseases of the heart and blood vessels.

Respiratory System—Nature, causes, symptoms, and treatment of catarrh, nasal gleet, roaring, bronchitis, pleurisy, inflammation of the lungs, etc.

Urinal System—Nature, causes, symptoms, and treatment of inflammation of the kidneys, etc.

Nervous System—Nature, causes, symptoms, and treatment of lock-jaw, string-halt, etc.

Sensitive System—Nature, causes, symptoms, and treatment of the diseases of the eye and ear,

Generative System—Nature, causes, symptoms, and treatment of abortion, parturition, milk fever, etc.

Tegumental System—Nature, causes, symptoms, and treatment of scratches, sallenders, mallenders, parasites, and other diseases of the skin.

MATERIA MEDICA.—The preparation, actions, uses, doses, of over one hundred of the principal medicines used in Veterinary practice.

Department 4—English and Political Economy.

English.—History of the English language; its formation and connection with other languages. The sentence, the paragraph and the period; capitals and punctuation; style—its varieties and qualities; the principal figures of speech defined and illustrated; accuracy, purity, propriety, clearness, precision, strength, and grace; false syntax discussed and corrected; prose and poetic diction distinguished; standard and characteristics of taste; pleasures of the imagination, etc.

Frequent exercises in letter-writing and impromptu composition.

Committing to memory and critical study of two of Shakespeare's plays, and of selections from Milton, Gray, Goldsmith, Cowper, and Scott.

Political Economy.—Utility; production of wealth; land, labour, capital; division of labour; distribution of wealth; wages; trades unions; co-operation; money; credit; credit cycles; functions of government; taxation; etc.

Department 5—Mathematics and Book-keeping.

Arithmetic.—Review of subject with special reference to farm accounts; tables of weights and measures; interest, discount, stocks, and partnership; equation of payments; alligation; exchange, etc.; mental arithmetic—calculation in simple rules, fractions, and compounds rules.

Mensuration.—Mensuration of surfaces and solids, with special reference to the measurement of lumber, timber, earth, etc.

Statics.—Forces; the mechanical powers; friction; the steam-engine; strength of materials; units of work; etc.

Dynamics.—Motion, forces producing motion, momentum, etc.

Hydraulics.—Transmission of pressure; the hydraulic press; specific gravity, density; pumps, siphons, etc.

Levelling and Surveying.—Fields surveyed with chain and cross-staff; heights and distances found by the theodolite.

Drainage.—General principles; discharging water-ways; how, where, and when to commence draining; depth of drains and distance apart; furrow drains; drains followed by other improvements; drainage implements; levelling.

Road-making.

Book-keeping.—Business forms and correspondence; general farm accounts; dairy, field, and garden accounts; laws relating to farming—deeds, mortgages, notes, etc.

II.—COURSE OF APPRENTICESHIP.

The students are daily distributed to each of the following departments:—

1. The Live Stock Department.
2. The Field Department.
3. The Horticultural Department.
4. The Mechanical Department.
5. The Experimental Department.

They are taught the manner of performing the various operations in each department by the instructor or his assistants in that department; and, being sent in rotation to each, it is expected that at the end of two years a thorough apprenticeship will have been served.

The instruction received in the class-room is, as far as possible, illustrated and exemplified in the fields, yards, and shops. The following may be taken as a few of the operations, in the performance of which apprenticeship is served:—

Field Department.—Cleaning, harnessing, and management of horses, ploughing, harrowing, cultivating, drilling, sub-soiling; sowing broadcast and by drill; planting, hoeing, and grubbing; haying by scythe and mower; harvesting; threshing, winnowing, stoning, draining, levelling, measuring, stumping, etc.

Live Stock Department.—Cutting, pulping, steaming, mixing, feeding, cleaning, general management of cattle feeding, lambing, shearing, castration, dipping, salving, hurdling; general management of sheep feeding, and general management of other stock.

Horticultural Department.—Digging, ploughing, raking, seeding, planting, hoeing, mowing, harvesting, storing; general management of vegetables, flowers, and lawn. Pruning, grafting, budding, mulching; general management of an orchard. General management of propagating houses, green-houses, vinery, nursery, hedges, walks and roads, etc., etc.

Mechanical Department.—Planing, sawing, nailing, grooving, matching, morticing, framing, and general use of commoner mechanical tools. Fencing, hurdle making, gate making, and general farm improvements. Repairs of all farm buildings, implements, machines, etc., etc.

TERMS, SESSIONS, VACATIONS, AND EXAMINATIONS.

Terms and Sessions.—The scholastic year commences on the 1st of October, and ends on the 31st of August. It is divided into two sessions, and each session into two terms, as follows:—

Fall Term—1st Oct. to 22nd Dec. Winter Term—5th Jan. to 31st Mar.	*Winter Session.*
Spring Term—16th April to 30th June. Summer Term—1st July to 31st Aug.	*Summer Session.*

Lectures commence on the 1st October, and continue throughout the first three terms—from 1st of October to 30th of June. During that time all regular students have class-room work, and manual labour alternately—three hours a day being spent at the former, and from three and a half to five at the latter. To this are added five hours in two weeks for set-up drill and gymnastics, so that the daily routine of every student in the regular course, for nine months of the year, is—

Lectures in the College.—Three hours a day (excepting Saturdays).
Manual Labour Outside.—Three and a half to five hours a day.
Study in Rooms.—Two hours a day.
Drill and Gymnastics.—One hour a day (for five days of every alternate week).

While the first year students are at lectures in the College, the second year students are employed outside. Those who go out to work in the forenoon, come in for lectures in the afternoon, and *vice versa*. Thus the theoretical work inside and the practical work outside go on simultaneously during the Fall, Winter and Spring Terms. The Summer Term (1st July to 31st August), is devoted entirely to work in the outside departments—the farm, the live stock, the garden, the carpenter shop, and experiments.

Vacations.—There are three vacations in the year—the Christmas vacation (22nd December to 5th January), the Easter vacation (1st to 16th April), and the Summer vacation (1st to 30th Sept.) The College boarding-house is closed during the vacations.

Examinations.—The examinations which every student is required to pass each year of the course, are also three in number—one in December, on the work of the Fall Term; one at the end of March, on the work of the fall and Winter Terms; and one at the end of June, on the work of the Spring Term. The last two embrace not only the class-room work, but also the handling and judging of live stock, and the various operations in the outside departments.

DIPLOMAS.

A diploma is given to each student who completes his course of study, and passes satisfactorily all examinations, both on the subjects contained in the curriculum, and on the work of his apprenticeship.

MEDALS.

Three medals are offered for competition among the students of the second year, designated—

The Gold Medal,
The First Silver Medal,
The Second Silver Medal.

All second year students are eligible to compete for these medals, provided they continue regularly from the beginning to the end of the course, without dropping out or missing any of the prescribed examinations.

In case of failures in first year Examinations, or in the Christmas Examinations of the second year, the President may grant Supplemental Examinations or entertain claims for an *ægrotat*, without interfering with the right to compete.

The competition is—

(1.) By written examinations at Easter on the class-room work of the Fall and Winter Terms.

(2.) By written examinations at the end of June on the class-room work of the Spring Term.

(3.) By practical examinations at the above dates on cattle, sheep, pigs, horses, and the various operations taught or performed on the farm, in the garden, or in the carpenter shop.

The minimum standard for the gold medal is 50 per cent. of the marks in each subject, and an aggregate of 75 per cent. of the total number of marks in all the subjects; for the silver medals, 50 per cent. in each subject, and an aggregate of 67 per cent. in all the subjects.

GENERAL REMARKS.

A few general remarks on the appliances and advantages possessed by the institution for training young men for agricultural pursuits, may be given in conclusion.

Farm and Carpenter Shop.

The carpenter shop is provided with three or four benches, and the tools necessary for plain work and general repairs.

The farm is being gradually laid out, cleaned, and drained. The best and most approved farm implements and machinery are used. Seven breeds of cattle, six of sheep, and three of pigs are kept for the purposes of instruction. The monthly fairs and fat cattle shows in the city of Guelph, are occasionally visited and reported on by the students.

Experiments.

A portion of the farm has been laid out in small plots; and a series of experiments with cereals, roots, grasses, manures, and various modes of management is regularly and systematically carried on from year to year. Besides the field experiments, others in the feeding of live stock are made during the winter, to test the several breeds of animals and the comparative values of different kinds of feed.

Horticultural Department.

In this department there are three green-houses, a four acre kitchen garden, a vinery, a thirty acre lawn, an arboretum, and a large variety of fruit and ornamental trees.

Veterinary Department.

The veterinary department has been fully organized and is doing good work. A complete skeleton of a horse and all the principal bones of ordinary farm animals have been provided for the class-room. When an animal dies from disease or any other ailment, it is dissected, the cause or causes of death sought for and pointed out in presence of the classes. Thus the work is made as practical as possible.

Library, Reading-room, and Gymnasium.

The Library contains over 4,000 volumes of choice reading on the different subjects embraced in the course of study, and a good selection of history, poetry, biography, and travel; the Reading-room is furnished with thirty-five or forty of the leading papers and periodicals; and the Gymnasium is provided with a horizontal bar, parallel bars, Indian clubs, dumb-bells, bar-bells, and most of the other articles used in common gymnastic exercises.

Advantages of the Course.

Besides becoming fairly skilled in the work of a farm, the student takes part in the cultivation of a garden, and thus increases his knowledge and improves his taste in a very important direction. He also acquires skill in the use of tools, so that he is not only able afterwards to make his own repairs, but knows when such work is properly done. He sees for himself the effects of various rotations and different modes of cultivation, and becomes acquainted on the experimental ground, and in the class-room, with many varieties of grasses, grains, roots and manures. The different breeds of cattle, sheep and swine, of common use in Canada, become familiar to him from daily contact with them; and the excellencies and defects of each he learns by lectures in the class-room, and by reference in the yards. He is taught how to keep live stock registers, accounts of field cropping, and regular farm accounts. He becomes acquainted with the prices of stock, implements, produce, building and improvements, and is prepared to transact the *business* of a farm. He obtains in the Veterinary Department a knowledge of the structure and functions of farm animals, and the most approved methods of treating and preventing the ordinary diseases to which such animals are liable. The study of the relations of the plant, the soil, and the animal to each other, and to his profession, under the heads of Botany, Chemistry, etc., not only shows him the reasons for the rules of the best farm practice, and enables him afterwards to discover other such rules, but likewise forms in him habits of reasoning closely, systematically and correctly, which cannot fail in after life to make him a better citizen. And, lastly, by this, as well as by the teaching in the class-room, by reading standard works in the library, and newspapers and periodicals in the reading-room, by contact with his fellow students, and by discussions carried on with them in their Literary Society, his mind is sharpened and strengthened, his views widened, and his power of thinking, and his ability to express his thoughts greatly increased. If the student be careless, thoughtless, or lazy, few of those advantages will be reaped; but if he be attentive, energetic and diligent the majority of them will be secured.

James Mills,
President.

PART II.

REPORT

OF THE

PROFESSOR OF CHEMISTRY.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, *December 16th, 1882.*

To the President of Ontario Agricultural College:

DEAR SIR,—As my official connection with the College began about four weeks before the time of holding the Easter examinations, my duties for the Winter Term consisted chiefly in finishing, by a few closing lectures, outlying portions of the work which my predecessor Professor Panton, before his departure for Winnipeg, had not been able to complete. It was with the beginning of the Spring Term that my full work in the department commenced. One of the subjects for the term was Practical and Analytical Chemistry.

The size of the College Laboratory is significantly given by Professor Panton in last year's Report. It is called "the private room of the Professor of Veterinary Science," capable of accommodating not more than six students at work. As it was impossible for the Professor to accommodate a class of forty or fifty students in a room of that size, "the nearest approach to giving them instruction" in practical chemistry was made "by performing the manipulations while the students looked on."

The unsatisfactoriness of this course the Professor frankly admits. "On asking a student to perform some practical work he was at a complete loss how to proceed, although the work had been done before the class on several occasions." After the confession of this unpleasant experience, Professor Panton very appropriately remarks, "Hands as well as eyes must be used in the operations of chemistry."

To overcome this difficulty, Professor Panton advised the building of a laboratory "capable of accommodating forty or fifty students at practical work," and provided "with a lecture-room, an apparatus-room, a workroom, general storeroom, and a private room, besides the room for practical work." This real want of the chemical department before my time, still exists, though in a somewhat limited sense.

At the beginning of the Spring Term, the class of Second Year students requiring instruction in analytical Chemistry numbered about forty. One of two methods had to be adopted; the old and unsatisfactory one of the Professor performing the operations of chemical analysis while the students looked on, or the satisfactory one of the students performing them while the Professor looked on. We decided to adopt the latter course if a room at all suitable could be found. In company with you, Sir, the cellars of the College were visited, and pronounced too damp and dark. Your readiness to meet the practical demands of every department of educational work under your charge, led you, we think wisely, to allow us the use of the Gymnasium or old Dining Hall as a room for practical work. You know the result. In a couple of days the students had constructed two long and convenient working tables, furnished with appropriate shelves for holding the necessary re-agent bottles, etc. Six complete sets of re-agent bottles were now mounted upon the shelves, alcohol and spirit lamps were exchanged for gas and Bunsen burners, and the work in Analytical Chemistry began.

Analytical tables were printed, and given to the students. The first table exhibited the separation of the metals into groups by the group-reagents, also the separation and identification of the metals of the First Group. The other tables illustrated the separation and identification of the metals of the Second, Third, Fourth, and Fifth Groups. Dr. Douglas and Prescott's work on "Qualitative Chemical Analysis," and Professor Caldwell's work on "Agricultural Qualitative and Quantitative Chemical Analysis," rendered us valuable service in our work.

We give the first of the printed tables a place in our report. We do this that the friends of the College may have an idea of the character of the practical work done by the students.

GROUPING OF METALS.

(Remove each group before testing for the next.)

I. Add HYDROCHLORIC ACID, a drop at a time, as long as a precipitate is produced : warm, agitate, and filter.

PRECIPITATE :

GROUP I.

Lead, $PbCl_2$, *white.*
Silver, $AgCl$, *white.*
Mercurosum, Hg_2Cl_2, *white.*

II. To the Filtrate, or, if Group I. is absent, to the original solution + HCl, add H_2S in excess ; warm and filter. (Free mineral acid must be sufficient for the formation of As_2S_3 and not to strong for complete precipitation of Sb_2S_3. If original solution is strongly acid—as after solution of dry substances by mineral acids—the excess of acid must be reduced by evaporation. Free chlorine must be fully expelled.

PRECIPITATE :

GROUP II.

Asenic, As_2S_2, *yellow.*
Antimony, Sb_2S_3 or Sb_2S_5, *orange.*
Tin, SnS, *brown.*
SnS_2, *yellow.*
Gold, Au_2S_3, *black.*
Changing in boiling to—
Au_2S, *brown.*
Platinum, PtS or PtS_2, *black.*
Lead, PbS, *black.*
Bismuth, Bi_2S_3, *black.*
Copper, CuS, *black.*
Cadmium, CdS, *yellow.*
Mercury, HgS, *black.*

(First, white to yellow.)

III. To the clear filtrate from Group II., in which H_2S will cause no precipitate (Phosphates, Oxalates, etc., being absent), and freed from H_2S by boiling, add a few drops of Nitric Acid and boil an instant to oxidize ferrosum. Immediately add NH_4Cl and excess of NH_4OH.

PRECIPITATE : GROUP III.—A.

Aluminium, $Al_2(OH)_6$, *white, gelatinous.*
Chromium, $Cr(OH)_6$, *bluish-green*
Ferricum, $Fe_2(OH_6)$, *reddish-brown.*

Filter and wash : To filtrate add $(NH_4)_2S$ and warm until precipitate subsides. Filter and wash.

PRECIPITATE : GROUP III.—B.

Maganese, MnS, *flesh-coloured.*
Cobalt, CoS, *black.*
Nickel, NiS, *black.*
Zinc, ZnS, *white.*

The entire Group III. is precipitated by Ammonium Sulphide, Chloride, and Hydrate, the same as above, except iron, FeS, *black.*

IN PRESENCE OF PHOSPHATES.

By Ammonium Sulphide, etc., etc.
All as above (iron as FeS) and Ba, Sr, Ca, Mg, Al, Cr, as Phosphates, *white.*

IV. ***To the Filtrate from Group III.***, containing NH_4Cl, add $(NH_4)_2CO_3$ and NH_4OH ; digest with gentle heat (not boiling) for some time, and filter.

PRECIPITATE :

GROUP IV.

Barium, $BaCO_3$, *white.*
Strontium, $SrCO_3$, *white.*
Calcium, $CaCO_3$, *white.*

V. ***The Filtrate contains :***

GROUP V.

Magnesium Salts.

Ammonium Salts.
Potassium "
Sodium "
Lithium "

ANALYLIS OF GROUP I.

The Precipitate is washed on the Filter with one or two small portions of cold water ; then treated with much HOT WATER, and filtered.

SOLUTION : $PbCl_2$.
Test for Lead by—
1. SULPHURIC ACID, giving $PbSO_4$, *white.*

REMAINING PRECIPITATE : $AgCl$, Hg_2Cl_2. Digest with dilute, warm NH_4OH, and filter.

Mercury, HgS, *black*.

(First, white to yellow.)

In Presence of Phosphates.

By Ammonium Sulphide, etc., etc.
All as above (iron as FeS) and Ba, Sr, Ca, Mg, Al, Cr, as Phosphates, *white*.

ANALYLIS OF GROUP I.

The Precipitate is washed on the Filter with one or two small portions of cold water; then treated with much HOT WATER, and filtered.

Solution: $PbCl_2$.

Test for Lead by—

1. Sulphuric Acid, giving $PbSO_4$, *white*.

   Not chemically changed or permanently dissolved by acids, yet slightly soluble in strong acids—Soluble in boiling $NH_4\ C_2H_3O_2$ and in the fixed alkalies. Soluble in warm Sodium Thiosulphate $Na_2S_2O_3$, solution at Temp. not above 68° C; (154° F.); in hot solution, lead sulphite is formed, insoluble in thiosulphate; distinction and separation from Barium Sulphate, which does not dissolve in thiosulphates.

2. Sulphuretted Hydrogen, PbS, *black*—

   Insoluble in dilute acids, alkalies, or alkali sulphides. Moderately dilute (15 to 25 per cent.) nitric acid dissolves the precipitate with separation of sulphur:

   $3PbS + 8HNO_3 = 3Pb\,(NO_3)_2 + 3S + 2NO + 4H_2O.$

   Concentrated nitric acid changes it mostly to the insoluble lead sulphate:

   $3PS + 8HNO_3 = 3PbSO_4 + 8NO + 4H_2O.$ In solutions excessively dilute with this re-agent, only a brown colouration occurs without precipitation, revealing lead in solutions 100,000 parts of water.

3. Chromate, $PbCrO_4$, *yellow*—

   Soluble in fixed alkali hydrates (distinction from Bismuth), insoluble in chromic acid (distinction from barium), decomposed by HCl and by NH_4OH.

4. Iodides, PbI_2, *bright yellow and crystalline*—

   Soluble in 1,900 parts of cold or 200 of hot water—soluble in hot moderately concentrated HNO_3, and in solutions of fixed alkalies, not in cold HCl.

The precipitates may be tested by the blow-pipe.

On charcoal alone, or more readily with Na_2CO_3, the lead is reduced to malleable globules. An incrustation of lead oxide forms around the mass—dark-yellow when hot, sulphur-yellow when cold, driven by the reducing flame, but non-volatile without reduction. The presence of this incrustation, in the reducing flame, imparts a blue colour to the outer flame.

Remaining Precipitate: AgCl, Hg_2Cl_2. Digest with dilute, warm NH_4OH, and filter.

Solution: $(NH_3)_3(AgCl)_2$.

Test for silver, after expelling any excess of ammonia by boiling, by acidulating slightly with *nitric acid*. A precipitate is AgCl. The recently precipitated silver chloride, acidulated with HCl or H_2SO_4, is reduced to the metal on introducing a piece of ZINC without agitation—the advancing boundary of dark-brown colour in the mass—evidencing the progress of the reduction.

On Charcoal, with Na_2CO_3, silver is reduced from its compounds in the blow-pipe flame, attested by a bright malleable globule. Dissolve the metallic globule by HNO_3 and test the resulting solution:

1. By HCl—precipitate, AgCl, *white curdy*.
2. By fixed alkalies, Ag_2O, *grayish-brown*.
3. By H_2S from neutral, acid or alkaline solutions, Ag_2S, *black*.
4. By HNa_2PO_4, *from neutral solutions*, Ag_3PO_4, *yellow*.
5. By Na_3AsO_3, *from neutral solutions*, Ag_3AsO_3, *yellow*.
6. By Na_3AsO_4, *from neutral solutions*, Ag_3AsO_4, *red-brown*.
7. By K_2CrO_4—Ag_2CrO_4, *dull red*.
8. *A bright strip of copper*, introduced into a solution of SILVER NITRATE, receives a lustrous silver coating.
9. *A globule of mercury*, placed in a concentrated solution of SILVER NITRATE on a watch glass, becomes covered with a deposit of silver *amalgam* in arborescent form—the silver tree, *Arbor Dianæ*.

Residue: NH_2Hg_2Cl, *black*.

If the lead chlorid is not all washed out with hot water, the NH_4OH will change it to insoluble *white* lead oxychloride, Pb_2OCl_2, and leave it with the mercury on the filter.

1. The black colour of the residue is the evidence of mercury.
2. Dry a portion of the residue, and heat it with Na_2CO_3 in a glass tube. A sublimate of *metallic mercury* condenses as a gray mirror coat on the inner surface of the cool part of the tube. The coating consists of globules, which, when gently rubbed with a glass rod, become visible to the eye.
3. Dissolve the remaining portion of the residue with nitro-hydrochloric acid, as mercuric chloride, $HgCl_2$. Precipitate from this solution:

1. By NH_4OH—NH_2HgCl, *white*.
2. By fixed alkalies—short of saturation, reddish-brown *basic salts*—to supersaturation, HgO, *orange-yellow*.
3. By H_2S—the precipitate is first white, becoming by further additions of reagent, yellow, orange, brown, and finally black. (The lighter coloured prec. $= HgCl_2HgS$). The black HgS is by sublimation and trituration converted to the red (vermilion) without chemical change.
4. By KI—HgI_2, first reddish-yellow, then red.

Reducing agents (Stannous chloride, boiling solution of sulphurous acid, or thiosulphates) precipitate from solutions of $HgCl_2$, first the white Hg_2Cl_2, then the gray Hg (strong acidulation with HNO_3 interferes with the re-action). By digestion with hot concentrated HCl, and a little solution of $SnCl_2$, the gray precipitate of divided mercury is converted into globules of metallic lustre. Glass-rod by trituration hastens result.

A clean strip of copper *placed* in a slightly acid solution of mercury becomes coated with metallic mercury. The tin-white lustre of the metal is seen by rubbing the coating with cloth or paper—heat drives off the coating. Zinc and iron also reduce mercury, etc., etc.

The analytical re-action of each base and of each acid was first studied; the separation of the metals into groups and of the acids next followed; finally, the student was required to analize unknown mixtures, containing from two to several compounds. Some of the bases and acids were separated with as much care as if their proportion by weight had to be determined. In the performance of this work, the operations of analysis in the *dry way* as well as those in the *wet way*, were used. It was also sought to give the student a clear conception of the nature of Ultimate and Proximate Organic Analysis.

The student was required to formulate every chemical change occurring in the analytical operations he made. By this exercise the *atomicity* and *basicity* of the metals and acids were thoroughly memorized. The student also became able mentally to combine, dissociate, oxidize, reduce, and transpose chemical elements, without the aid of blackboard and chalk. The student was also required to translate chemical equations into statements of proportional parts by weight. This was done that he might acquire correct and clear ideas of the significance of formulæ and equations, and be able to refer all chemical expressions to the facts of quantitative operations. It was also sought to make the student acquainted with the Chemical Relations of Substances. The study of an acid involved the study of its deportment with all the bases. The practical and theoretical character of the examination paper and exercise must convince all that definite results were not only aimed at, but, in a measure, arrived at by the last class in Practical and Analytical Chemistry.

We are in full accord with the view expressed by Professor Panton in last year's Report, in regard to the importance of having another year added to our course in Chemistry. "It can never be expected that a student coming here for the short period of two years can graduate an adept in Chemical Science, when universities thoroughly equipped demand a much more lengthened period." We think that every student should know something of quantitative analysis before graduation. He should be able to describe the physical properties of soils, mechanically to separate and chemically to analyze them. He should further have some experience in the analysis of natural and artificial manures, and of many kinds of farm produce. To do this conveniently he must acquire a knowledge of the operations of Volumetric Analysis.

There is no one to-day who needs a fuller knowledge of chemistry than the able and practical farmer. As he has now, in many instances, to deal with the improvement of worn out lands, it has become highly necessary that he should be able to make an intelligent application of the elements of fertility directly to the soil by means of rich domestic manures and concentrated commercial fertilizers. If he is able to ascertain the percentage composition of a fertilizer, he can, in a simple manner, compare the cost of manure with its real value. Want of knowledge in this important respect, has led many a purchaser to pay more for the number of pounds of nitrogen or phosphoric acid (in 100 pounds of the article he was buying) than he would have to pay for the same number of pounds of nitrogen in the form of sulphate of ammonia from the gas works, or of phosphoric acid in the bone-black of the sugar refineries.

All our students should be able to analyze milk quantitatively. The lactometer-test of the purity of milk brought to the cheese factory or to the city, has frequently injured and humbled the honest, and rewarded and honoured the dishonest, who were shrewd enough to skim the milk before they watered it.

We are no longer able to meet the increased demands of the Chemical Department, with the annual appropriation of one hundred and fifty dollars. One student, doing chemical work in a thoroughly furnished laboratory of Europe, will spend as much in the same time for fees, apparatus, and breakages. The straitness of our position will be understood, when it is remembered that we are expected to illustrate by experiment lectures on Inorganic, Organic, and Agricultural Chemistry, and on Meteorology, and to furnish a class of fifty students with full sets of re-agents, apparatus, etc., for doing practical work. If the laboratory were well furnished, the present appropriation could not, under existing circumstances, keep it efficient. It is very galling to the practical chemist, in the absence of suitable apparatus, to be obliged to indicate on the blackboard facts that lie at the base of many of the physico-chemical theories of to-day. If we had not had a little inventive skill, these breaks in the experimental demonstration would have been more numerous and unpleasant than they were.

Successfully to carry out the proposed scheme of co-operative experimenting upon the experimental field plots, apparatus for the quantitative analysis of soils, manures, and farm produce, should be forthcoming.

To determine accurately the amount of rainfall, and at the same time to collect rain in sufficient quantity to allow of its chemical analysis, and to ascertain the composition of the drainage water from some at least of the experimental field plots, a large rain gauge of 1-1000th of an acre area, and some drain gauges at different depths in the soil, are to be constructed. Professor Brown informs me that these important additions to the Experimental Department will be made next summer. The Chemical Department will have to determine the composition of the rain and drainage waters.

It will interest and instruct our students to know the amount of nitric acid and of ammonia the rain conveys from the atmosphere to an acre of the farm yearly, and also the quantity of soluble material (plant food) drainage waters yearly remove from the soil. From these considerations it must be evident that the increased experimental work of the College, inside and outside, calls loudly for a more liberally furnished and sustained laboratory.

Results of Experiments at Rothamsted, England.

In June of this year "Memoranda of the Origin, Plan, and Results of the Experiments conducted on the Farm and in the Laboratory of Sir John Bennet Lawes, Bart., LL.D., F.R.S., at Rothamsted, Herts," have been published. The Memoranda contain a most interesting and instructive history of the origin, plan, and results of a series of systematic field experiments which Dr. Lawes, assisted by Dr. Gilbert and others, has been conducting with the most important crops of rotation on the same land, without manure, with farm-yard manure, and with a great variety of chemical manures, since 1843. A brief review of these experiments cannot fail, we think, to interest the farmers of Ontario.

Field experiments have been conducted—
On wheat, 39 years in succession.
On wheat, alternated with fallow, 31 years.
On wheat of different descriptions, 15 years.
On beans, alternated with wheat, 28 years.
On beans, 32 years, including one year wheat and five years fallow.
On barley, 31 years in succession.
On oats, 10 years, including one year fallow.
On clover, with fallow on corn crop intervening, 26 years.
On turnips, 28 years, including three years barley.
On sugar-beet, five years.
On mangold-wurzel, seven years.
On potatoes, seven years (in progress).
On rotation, 35 years.
On permanent grass land, 27 years.

Weighed portions of all the experimental crops have been dried at 100°C., and the dry matter determined. The dried mass has then been burnt to ash on platinum sheets in cast-iron muffles, and the quantity of ash determined and recorded. In some of the samples the nitrogen existing as albuminoids, amides, and nitric acid, has been determined. Seven hundred complete ash analyses have been made.

One thousand samples of the soils of the experimental plots to the depth of 9in., 18in., and 27in. have been taken and submitted to partial separation, while portions of the mould have been carefully analyzed.

The nitrogen, as ammonia and nitric acid, in the rain waters, and the quantity and composition of the water percolating through 20in., 40in., and 60in. depth of soil, have been determined. It has also been sought, by a series of smaller drain gauges, to determine the influence of different crops and different manures on the amount and composition of drainage waters.

In the experiments on cattle feeding, the following points have been investigated:—

1. The amount of food, and of its several constituents, consumed in relation to a given live weight of animal within a given time.

2. The amount of food, and its several constituents, consumed to produce a given amount of increase in live weight.

3. The proportion and relative development of the different organs or parts of different animals.

4. The proximate and ultimate composition of the animals in different conditions as to age and fatness, and the probable composition of their increase in live weight during the fattening process.

5. The composition of the solid and liquid excreta (the manure) in relation to the food consumed.

6. The loss or expenditure of constituents by respiration and the cutaneous exhalations—that is, in the sustenance of the living meat—and manure-making machine. Weighed quantities of food, whose composition had been determined by analyses, were fed to oxen, sheep, and pigs for weeks, and even months, at a time; the weights of the animals during the progress of the experiment taken; and the amount of food to produce a given amount of increase of live weight determined.

Complete analyses of the entire carcases of some animals were made.

Experiments were also conducted with oxen, sheep, and pigs to ascertain the composition of the manure in relation to that of the food consumed.

We shall indicate briefly some of the most interesting results of the field experiments on the gowth of permanent meadow grass, wheat, barley, oats, and some leguminous crops.

The experiments with no manure, and with different manures on Permanent Meadow Land gave per acre per annum, weighed as hay, the following results:—

1. Unmanured, continuously, 20 years' average produce, $21\frac{1}{4}$ cwts.
2. 14 tons farm-yard manure, eight years, average produce, $42\frac{7}{8}$ cwts.
3. 14 tons farm-yard manure and 200 ℔s. ammonia salts (equal parts sulphate and muriate of ammonia), eight years, average produce, $49\frac{1}{2}$ cwts.
4. $3\frac{1}{2}$ cwts. superphosphate of lime, 20 years, average produce, $22\frac{1}{4}$ cwts.
5. $3\frac{1}{2}$ cwts. superphosphate of lime and 400 ℔s. ammonia salts, 20 years, average produce, $32\frac{1}{4}$ cwts.
6. 275 ℔s. nitrate of soda, 20 years, average produce, $33\frac{7}{8}$ cwts.
7. 300 ℔s. sulph. potass. 100 ℔s. sulph. soda, 100 ℔s. sulph. mag., $3\frac{1}{2}$ cwts superphos., 600 ℔s. ammonia salts, average produce, 20 years, $57\frac{5}{8}$ cwts.
8. Same as No. 7. with 400 ℔s. sil. sod. (200 ℔s. silicate soda and 200 ℔s. silicate lime), 20 years, average produce, $62\frac{1}{2}$ cwts.

By comparing these results it will be seen (1) that the average produce from farm-yard manure doubles that from no manure, (2) that the average produce from superphosphate of lime is about equal to that from no manure, (3) that nitrate of soda and ammonia salts give fair results, (4) that the highest yield is reached when sulphate of potassium, of soda, and of magnesia, superphosphate of lime, ammonia salts, and silicates of soda and of lime are combined, the average produce per acre of hay being in this case one ton more than that from farm-yard manure.

The experiments on the growth of wheat, without manure and with different kinds of manure, gave per acre per annum, in bushels, the following results:—

1. Unmanured, continuously, 30 years, average produce, $13\frac{1}{8}$ bushels; weight per bushel, $57\frac{7}{8}$ ℔s.
2. Farm-yard manure (14 tons every year), 30 years, average produce, $33\frac{1}{2}$ bushels; weight per bushel, 60 ℔s.
3. $10\frac{1}{2}$ cwts. superphosphate of lime, 30 years, average produce, $16\frac{3}{8}$ bushels; weight per bushel, $58\frac{1}{8}$ ℔s.
4. 400 ℔s. ammonia salts, 30 years, average produce, $20\frac{1}{2}$ bushels; weight per bushel, $56\frac{7}{8}$ ℔s.
5. 400 ℔s. ammonia salts, and $3\frac{1}{2}$ cwts. superphosphate, 30 years, average produce, 26 bushels; weight per bushel, $57\frac{3}{8}$ ℔s.

6. 400 lbs. ammonia salts, $3\frac{1}{2}$ cwts. superphosphate, and $366\frac{1}{2}$ lbs. sulphate of soda, 30 years, average produce, 31 bushels; weight per bushel, 59 lbs.

7. 200 lbs. sulph. potass., 100 lbs. sulph. soda, 100 lbs. sulph. mag., $3\frac{1}{2}$ cwts. superphosphates, 550 lbs. nitrate of soda, 30 years, average produce, $36\frac{1}{2}$ bushels; weight per bushel, $58\frac{1}{2}$ lbs.

8. 550 lbs. nitrate of soda, 30 years, average produce, $23\frac{5}{8}$ bushels; weight per bushel, $56\frac{1}{4}$ lbs.

The experimental results on wheat greatly resemble those on permanent meadow land. The average produce from farm-yard manure more than doubled that from no manure. Superphosphates, though liberally supplied, gave alone little more than no manure; nitrate of soda little more than ammonia salts. A mixture of ammonia salts and superphosphate yielded more than either taken separately. There are two other results in the tables of Lawes and Gilbert that equal No. 6. Ammonia salts and superphosphates are the same in each case, but sulphate of potash takes the place of sulphate of soda in the one case, and sulphate of magnesia that of sulphate of soda in the other. It would seem from No. 7 that the full effect of one manure is only obtained when a combination of manures is used. The yield in No. 7 is greater than that from farm-yard manure. The weight per bushel of wheat from farm-yard manure is greater than that from any of the artificial manures.

The experiments on barley gave, under the same conditions, per acre per annum the following results :—

1. Unmanured, continuously, 30 years, average produce, $17\frac{7}{8}$ bushels; weight per bushel, 52 lbs.

2. $3\frac{1}{2}$ cwts. superphosphate of lime, 30 years, average produce, 23 bushels; weight per bushel, $53\frac{1}{4}$ lbs.

3. 275 lbs. nitrate of soda, 30 years, average produce, $34\frac{1}{8}$ bushels; weight per bushel, $51\frac{7}{8}$ lbs.

4. 200 lbs. ammonia salts, 30 years, average produce, $30\frac{3}{4}$ bushels; weight per bushel, $52\frac{1}{8}$ lbs.

5. 275 lbs. nitrate soda, 400 lbs. silicate soda, 200 lbs. sulph. potass., 100 lbs. sulph. soda, 100 lbs. sulph. mag., and $3\frac{1}{2}$ cwts. superphosphate, 30 years, average produce, $47\frac{3}{4}$ bushels; weight per bushel, $54\frac{7}{8}$ lbs.

6. Farm-yard manure (14 tons every year), 30 years, average produce, 49 bushels; weight per bushel, $54\frac{1}{4}$ lbs.

7. 100 lbs. rape cake, 30 years, average produce, $43\frac{1}{4}$ bushels; weight per bushel, $53\frac{3}{4}$ lbs.

We have only given in our review of the experiments on barley the results of the simple manures, and the greatest result obtained from the combination of different manures. In the tables of Lawes and Gilbert, the combination of superphosphate with ammonia salts, nitrate of soda, and rape cake is seen greatly to increase the result. The highest results on the growth of barley were obtained from farm-yard manure.

Oats treated in the same manner as wheat and barley gave per acre per annum :—

1. Unmanured, five years, average produce, $19\frac{7}{8}$ bushels; weight per bushel, $33\frac{3}{4}$ lbs.

2. 400 lbs. ammonia salts, five years, average produce, 47 bushels; weight per bushel, $35\frac{7}{8}$ lbs.

3. 550 lbs. nitrate of soda, five years, average produce, $47\frac{1}{8}$ bushels; weight per bushel, $35\frac{1}{2}$ lbs.

4. 400 lbs. ammonia salts, 200 lbs. sulphate potass., 100 lbs. sulphate soda, 100 lbs. sulphate magnesia, and $3\frac{1}{2}$ cwts. superphosphate, five years, average produce, 59 bushels; weight per bushel, 37 lbs.

In these experiments ammonia salts and nitrate of soda give about the same results, while with one of them in combination with different manures the highest results were reached.

The results of some of their experiments on the growth of beans are exceedingly interesting. Mineral constituents used as manure (more particularly potass.) increased the produce very much during the early years; ammonia salts produced very little effect, nitrate of soda more marked effects. When we remember that a leguminous crop contains two or more times as much nitrogen as a cereal one grown under similar circumstances as to soil, etc., we cannot understand why ammonia salts, so rich in results with the cereals, should have little or no effect upon the growth of beans. "Leguminous crops grown too frequently on the same land seem to be peculiarly subject to disease, which no conditions of manuring that we have hitherto tried seem to obviate."

In alternating wheat with beans, Lawes and Gilbert obtained the remarkable result, that nearly as much wheat and nearly as much nitrogen were yielded in eight crops of wheat in alternation with the highly nitrogenous beans as in sixteen crops of wheat grown consecutively without manure in another field, and also nearly as much as were obtained in a third field in eight crops alternated with bare fallow.

The experiments with red clover (*trifolium pratense*) on ordinary arable land gave results with potassium and ammonia salts similar to those already indicated for beans. Lawes and Gilbert further found that neither organic matter rich in carbon as well as other constituents, nor ammonia salts, nor nitrate of soda, nor mineral constituents, nor a complex mixture, supplied as manure, availed to restore the clover-yielding capabilities of the land. If these were applied in large quantity and at considerable depths, they found that the result was better than when they were used in only moderate quantities and applied only on the surface. The results of numerous experiments by Lawes and Gilbert seem to exclude the supposition that the primary cause of failure (clover sickness) is either destruction by parasitic plants or insects, injury from excreted matters, or the shade of a corn crop, and to indicate that it must be looked for in exhaustion of the soil. "When the land is what is called 'clover sick,' none of the ordinary manures, whether artificial or natural, can be relied upon to secure a crop." "The only means of insuring a good crop of red clover is to allow some years to elapse before repeating the crop upon the same land."

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2. GEOLOGY.

For the very valuable collection of minerals that the Honourable Commissioner of Agriculture has been pleased, at your suggestion, to make to the Geological Section of the Museum, we have many thanks to offer. The act is a timely one. Professor Panton in his endeavours to make his geological lectures as practical as those on chemistry, collected during his three years' stay at the College, at his own expense, a number of characteristic rocks and fossils, and a few of the more important minerals. In the absence of many of the most essential mineral constituents of rocks, the lecturer on Geology found it extremely difficult to instruct the student practically in many parts of the lithological work. For the same reason the student could not easily and clearly understand the process by which rocks were disintegrated and the different soils produced. As rocks have a mineralogical as well as a chemical composition, their study can be made truly interesting and instructive only when minerals and chemical formulæ unite in the illustration of it. There is no department of Geology so full of living interest to-day as Lithology. By the use of the microscope and chemical analysis, it has been found that by the decomposition of rocks, the fertile soils and most of the ore veins and beds have been produced. The crystalline rocks composing the scum of the once molten earth, contain all the metals of the ores, all the indispensable and supplementary constituents of plants, in a finely divided state. The decomposition of the rocks at the surface gives rise to the different soils, that of rocks below the surface to the metallic ore beds.

If it is concluded to add one year to the College course of study, we shall hail with pleasure the enlargement and completion of the Museum, and the establishment of a course in Microscopical Lithology. But even in the absence of an extension in the course of study, the museum building should be completed. Rocks, fossils, and minerals lie about in ungainly heaps in the Museum, owing to the entire absence of suitable cases in which to place them. For the same reason many specimens of rare minerals from the Continent of Europe, which we have wished to see exhibited in the Museum, lie yet in boxes. It would be the height of folly to fit up the Museum in its present unfinished condition with the necessary cases.

3. METEOROLOGY.

Report of Observations taken at the Ontario Agricultural College during 1882.

During the past year no additions have been made to the instruments of the Meteorological Department of our College.

Observations are regularly taken at the hours of 7 a.m., 2 p.m., and 9 p.m. daily, and recorded in a book printed for the purpose. The instruments in use are as follows:—

Anemometer—Recording the direction of the wind and indicating the number of miles travelled.

Barometer—Showing the atmospheric pressure at the time of observation.

Maximum thermometer—Indicating the highest temperature between times of observation.

Minimum thermometer—Indicating the lowest temperature between times of observation.

Hygrometer—With *dry* and *wet* bulb thermometers, for the purpose of showing the condition of the atmosphere with reference to moisture.

Pluviameter—Used in measuring the rainfall.

Thermometer—For observing ordinary temperature.

Besides taking observations from these instruments, the cloudiness of the sky is observed, and general remarks on the weather for the day are recorded in the daily register. Each morning a form, as seen below, is filled out and given for publication to the daily papers in Guelph. At the close of each month a summary of the month's observations is also given for publication. From these monthly summaries the condensed statement of the year's meteorology is made out.

In my course of lectures on Meteorology, the practical method of teaching, so successfully used by my predecessor, is adopted. "The instruments named above are fully described, and the students taught not only how to read them, but also to epitomize the observations taken in such a way as to make them interesting and instructive."

At examinations the same practical method is used.

The "series of experiments for the purpose of ascertaining some facts in reference to the temperature of different soils exposed to similar conditions," promised by Professor Panton in last year's Report, I shall begin in the near future.

Form of Record Published Daily in the Guelph Papers.

WEATHER RECORD.

Ontario Agricultural College.

..........1882.

Normal height of barometer at Guelph (1,100 feet above sea level and 740 above Lake Ontario), 28·86 inches. Average temperature for........

Barometer ...... { Height......inches.
Change......

Hygrometer........Moisture......

Anemometer .... { Direction of wind......
Miles travelled during previous twenty-four hours......

Minimum temperature during preceding twenty-four hours......
Maximum " " " " ......
Pluviameter—Rainfall......inches.

Form of Monthly Summary.

Meteorology.

A summary of the meteorological observations taken at Ontario Agricultural College during the month of ....

Barometer—
- Highest barometer.
- Lowest "
- Highest mean barometer.
- Lowest " "
- Monthly " "
- Monthly range.

Thermometer—
- Highest thermometer.
- Lowest "
- Highest meam thermometer.
- Lowest " "
- Monthly " "
- Monthly range.

Hygrometer—
- Day of greatest humidity.
- Day of least "
- Mean "

Pluviameter—
- Days rain fell.
- Greatest rainfall.
- Days snow fell.
- Greatest snowfall.
- Total precipitation.

Anemometer—
- Direction of wind.
- Greatest number of miles travelled in twenty-four hours.
- " velocity per hour.
- Mean velocity per month.

Clouds—
- Cloudy days.
- Clear "
- Mean cloudiness for the month.

The following is a summary of the observations taken during the year 1882 :—

January.

Barometer—

Highest barometer	24th, 2 p.m.,	29·476	inches.
Lowest "	26th, 9 p.m.,	28·174	"
Highest mean barometer	24th, ...	29·424	"
Lowest " "	28th, ...	28·426	"
Monthly " "	....	28·874	"
Monthly range	....	1·302	"

Thermometer—

Highest temperature	8th,	48·3°	
Lowest "	24th,	22°	below zero.
Highest mean temperature	26th,	42·25°	
Lowest " "	23rd,	10·5°	below zero.
Monthly " "		20·5°	
Monthly range		70·3°	

Pluviameter—

Days rain fell	4,	1·06 inches.
Greatest rainfall..................................	26th,	0·64 "
Days snow fell	5,	11·5 "
Greatest snowfall	21st,	4·5 "
Total precipitation..................................		2·21 "

Anemometer—

	N.	E.	W.	S.	N.E.	N.W.	S.E.	S.W.	
Direction of wind..	5	4	15	7	8	12	11	43	times.

Greatest number of miles travelled in 24 hours .... 22nd, 896 miles.
Greatest velocity per hour................ 22nd, 9 a.m., 48 "
Mean for the month.................................... 14·3 "

Clouds—

Cloudy days..	11
Clear days	4
Mean cloudiness for the month..................................	6·7

Remarks—

January has been a month of considerable meteorological interest, characterized by mildness and great extremes in temperature.

The third week is of special interest. On the 23rd extreme cold set in and reached 22° below zero on the morning of the 24th. This is the coldest day on record for 25 years. Immediately the thermometer began to rise, and in 24 hours reached 30° above zero, increasing till followed by heavy rains on the 26th.

On Wednesday (25th) we had comparatively good sleighing, but the rain of Thursday swept it away, and on Friday the wheeling could not have been surpassed. The month has been cloudy, with but few bright clear days. Very little snow has fallen, and sleighing has lasted but a day or two at a time.

The weather on the whole has been very mild and agreeable, in some respects resembling that of the first weeks of winter more than what we expect to see in mid-winter.

February.

Barometer—

Highest barometer	18th,	7 a.m.,	[illegible]8 inches.
Lowest "	28th,	9 p.m.,	2[illegible] "
Highest mean barometer..............	18th,	....	29·[illegible] "
Lowest " "	21st,	....	28·[illegible] "
Monthly " "			28·[illegible] "
Monthly range			1·48

Thermometer—

Highest temperature	13th,	49·5°
Lowest "	18th,	8°
Highest mean temperature	13th,	41·3°
Lowest " "	28th,	13·6°
Monthly " "		27·8°
Monthly range		41·5°

Pluviameter—

Days rain fell	5,	1·37 inches.
Greatest rainfall..................................	16th,	0·7 "
Days snow fell	9,	10·46 "
Greatest snowfall	18th,	3·5 "
Total precipitation		2·41 "

Anemometer—

	N.	E.	W.	S.	N.E.	N.W.	S.E.	S.W.	
Direction of wind..	1	7	6	15	12	6	11	18	times.

Greatest number of miles travelled in 24 hours......21st, 825 miles.
Greatest velocity per hour................10th, 2 p.m., 45·6 "
Mean for the month.................................14·6 "

Clouds—

Cloudy days 15
Clear days 9
Mean cloudiness for the month........................... 2.1

Remarks—

The month began cold. During the first week snow fell to the depth of two inches on the 2nd, followed by cold up to the 6th. Rain fell on the 7th, followed by cold up to the 11th, when 23° of frost were registered. The days were mild and beautiful from the 12th to the 18th, during which time 35 inches of rain fell. From the 19th to the 25th the weather was very unsettled, being mild and raining and snowing alternately.

The month on the whole was cloudy and much milder than January.

March.

Barometer—

Highest barometer .... 8th, 7 a.m., 29·438 inches.
Lowest .... 27th, 2 p.m., 28·048 "
Highest mean barometer.............. 8th, ... 29·343 "
Lowest " " .... 28th, ... 28·235 "
Monthly " " .... 28·834 "
Monthly range .... 1·390 "

Thermometer—

Highest temperature .... 27th, 57·6°
Lowest " .... 24th, 10°
Highest mean temperature....................... 1st, 43·3°
Lowest " " .... 14th, 17·5°
Monthly " " .... 30·3°
Monthly range.................................. 47·6°

Pluviameter—

Days rain fell .... 5, 1·42 inches.
Greatest rainfall .... 8th, 0·59 "
Days snow fell .... 11, 13·29 "
Greatest snowfall .... 21st, 3·5 "
Total precipitation .... 2·75 "

Anemometer—

	N.	E.	W.	S.	N.E.	N.W.	S.E.	S.W.	
Direction of wind..	7	13	8	5	9	22	6	15	times.

Greatest number of miles travelled in 24 hours......30th, 710 miles.
Greatest velocity per hour ....29th, 2 p.m., 48 "
Mean for the month..................................15·3 "

Clouds

Cloudy days 10
Clear days 4
Mean cloudiness for the month..... .... 6·7

Remarks—

The first days of March were beautiful, on the 2nd 54° temperature being registered. From the 4th to the 11th the weather was unsettled, snow falling on the 7th, rain to the depth of 0·59 inches on the 8th, changing again to snow. From the 12th to the 18th the weather was again unsettled, with snow and rain; from the 19th to the 25th cold and mild, with some heavy winds and snow. The month ended mild, on the 27th 57·6° at two p.m. being registered.

April.

Barometer—

Highest barometer	3rd, 7 a.m.,	29·202	inches.
Lowest "	19th, 9 p.m.,	28·034	"
Highest mean barometer	5th, ...	29·020	"
Lowest " "	19th, ...	28·207	"
Monthly " "		28·810	"
Monthly range		1·168	"

Thermometer—

Highest temperature	18th, 63·4°
Lowest "	10th, 18·3°
Highest mean temperature	18th, 51·1°
Lowest " "	10th, 21·4°
Monthly " "	38·6°
Monthly range	45·1°

Pluviameter—

Days rain fell	7, 1·35	inches.
Greatest rainfall	19th, 0·86	"
Total precipitation	1·35	"

Anemometer—

	N.	E.	S.	W.	N.E.	N.W.	S.E.	S.W.	
Direction of wind..	4	11	18	7	29	4	8	8	times.

Greatest number of miles travelled in 24 hours	20th,	626	miles.
Greatest velocity per hour	20th, 2 p.m.,	38	"
Mean for the month		13·6	"

Clouds—

Cloudy days	8
Clear days	10
Mean cloudiness for the month	2

Remarks—

April opened with a few days of warm weather, followed by cold, with north-westerly winds. During the first week rain fell to the depth of 0·41 inches. From the 9th to the 15th the weather was very changeable; the rest of the month was comparatively mild. The prevailing winds were from the north-east. April was remarkable this year for the absence of the usual April showers, that makes spring early, and the growth of the plants rapid.

May.

Barometer—

Highest barometer	18th, 7 a.m.,	29·204	inches.
Lowest "	31st, 9 p.m.,	28·312	"
Highest mean barometer	18th, ...	29·187	"
Lowest " "	31st, ...	28·403	"
Monthly " "		28·875	"
Monthly range		0·892	"

Thermometer—

Highest temperature	30th, 69°
Lowest "	2nd, 27°
Highest mean temperature	9th, 59·7°
Lowest " "	2nd, 33·4°
Monthly " "	47·63°
Monthly range	42°

Pluviameter—

Days rain fell .... 9, 2·84 inches.
Greatest rainfall .... 8th, 0·9 "
Total precipitation .... 2·84 "

Anemometer—

	N.	E.	W.	S.	N.E.	N.W.	S.E.	S.W.	
Direction of wind..	1	5	2	2	14	9	4	11	times.

Greatest number of miles travelled in 24 hours.. 12th, 762·3 miles.
Greatest velocity per hour .... 12th, 2 p.m., 40·2 "
Mean for month .... 13·159 "

Clouds—

Cloudy days 10
Clear days 17
Mean cloudiness for the month .... 0·8

Remarks—

May opened chilly, the first week was rainy, followed by wind; the second was changeable, mild weather, followed by cold; the middle of the month also rainy, three days of rain in succession, the greatest depth in 24 hours being 0·75. After the 15th it was again changeable, heat followed by cold till the 22nd, when rain fell to the depth of 0·4, after which we had warmer and more settled weather. On the last day the wind was strong, and rain fell to the depth of 0·33 inches. The prevailing winds were from the north-east and south-west.

June.

Barometer—

Highest barometer .... 22nd, 7 a.m., 29·062 inches.
Lowest " .... 18th, 9 p.m., 28·372 "
Highest mean barometer .... 21st, ... 29·046 "
Lowest " " .... 3rd, ... 28·436 "
Monthly " " .... "
Monthly range .... 0·690 "

Thermometer—

Highest temperature .... 25th, 86°
Lowest " .... 3rd, 39·1°
Highest mean temperature .... 24th, 73·5°
Lowest " " .... 3rd, 47·5°
Monthly " " .... 61·5°
Monthly range .... 46·9°

Pluviameter—

Days rain fell .... 9, 1·98 inches.
Greatest rainfall .... 9th, 1·37 "
Total precipitation .... 1·98 "

Anemometer—

	N.	E.	W.	S.	N.E.	N.W.	S.E.	S.W.	
Direction of wind..	2	2	2	1	6	11	8	15	times.

Greatest number of miles travelled in 24 hours.... 1st, 514·9 miles.
Greatest velocity per hour .... 2nd, 2 p.m., 38·4 "
Mean for month .... 10·4 "

Clouds—

Cloudy days 12
Clear days 8
Mean cloudiness for the month .... 2·7

Remarks—

June opened with rain and cold, the morning of the 2nd being milder was followed by a rain upon the 3rd; the 4th was dry though cloudy, rain falling upon the 5th to the depth of 0·13 inches. There were then three days of clearer and milder weather, which were followed by two days of rain in succession, the weather was then clear and mild up to the middle of the month, after which we had it very changeable, heat followed by cold, though it was comparatively calm. The prevailing winds were from the north-west.

July.

Barometer—

Highest barometer	15th, 2 p.m.,	29·122	inches.
Lowest "	6th, 7 a.m.,	28·000	"
Highest mean barometer	15th, ...	29·080	"
Lowest " "	3rd, ...	28·274	"
Monthly " "		28·802	"
Monthly range		1·122	"

Thermometer—

Highest temperature		
Lowest "	26th,	88°
Highest mean temperature	22nd,	49·5°
Lowest " "	26th,	75°
Monthly " "	22nd,	53·8°
Monthly range		66·9°
		38·5°

Pluviameter—

Days rain fell	5,	
Greatest rainfall	18th,	0·245 inches.
Total precipitation		0·301 "

Anemometer—

	N.	E.	W.	S.	N.E.	N.W.	S.E.	S.W.	
Direction of wind	2	1	14	3	3	12	1	14	times.

Greatest number of miles travelled in 24 hours	31st,	355·9	miles.
Greatest velocity per hour	25th,	25·5	"
Mean velocity for the month		9·264	"

Clouds—

Cloudy days	23
Clear days	4
Mean cloudiness for the month	6·4

Remarks—

The anemometer was not in working order during the first two weeks of the month, the statistics given apply, therefore, only to the last two weeks.

July opened with mild weather and equal temperature. During the first week the barometer was unsteady, falling low upon the 6th, then suddenly making a great rise on the 8th, accompanied by a northerly wind. It fell steadily on the 9th, 10th, and 11th, with a corresponding fall in the temperature during the evenings, and with light showers on the 9th and 10th. On the 12th we had another fall both in the atmospheric pressure and in the temperature, with rain to the depth of 0·22 inches. We then had a steady rise in the barometer, and clear bright weather up to the 16th, when the barometer fell. The weather became sultry, and a rainfall to the depth of 0·245 inches. The barometer then rose steadily to the end of the month, accompanied by fine weather.

August.

Barometer—

Highest barometer	18th, 2 p.m.,	29·988	inches.
Lowest "	9th, 7 a.m.,	28·505	"
Highest mean barometer	18th, ...	29·316	"
Lowest " "	8th, ...	28·558	"
Monthly " "		28·892	"
Monthly range		1·483	"

Thermometer—

Highest temperature	6th,	87·5°
Lowest "	20th,	42·5°
Highest mean temperature	15th,	75°
Lowest " "	18th,	57·5°
Monthly " "		65·7°
Monthly range		45°

Pluviameter—

Days rain fell	11,	
Greatest rainfall	22nd,	1·12
Total precipitation		3·78

Anemometer—

	N.	E.	W.	S.	N.E.	N.W.	S.E.	S.W.
Direction of wind..	5	6	8	5	6	6	8	10 times.

Greatest number of miles travelled in 24 hours..	14th,	395·6	miles.
Greatest velocity per hour	15th,	36	"
Mean velocity for the month		7·866	"

Clouds—

Cloudy days	18
Clear days	10
Mean cloudiness for the month	6·06

Remarks—

August opened with a high barometric pressure and moderate temperature, the pressure gradually decreasing, accompanied on the 2nd by a warm rain. During the 4th, 5th, and 6th the weather was mild and pleasant, with a warm southerly wind. Up to the 15th pressure was unsteady, and the winds variable, the latter continuing to the end of the month. On the 6th, 7th, 8th, and 9th we had rain to a total depth of 1·99 inches. The weather was mild during the day and cool at night. We had very little thunder this month.

September.

Barometer—

Highest barometer	25th,	9 p.m.,	29·270	inches.
Lowest "	14th,	9 a.m.,	27·560	"
Highest mean barometer	25th,	....	29·238	"
Lowest " "	14th,	....	28·599	"
Monthly " "			28·818	"
Monthly range			0·710	"

Thermometer—

Highest temperature	18th,	85·5°
Lowest "	24th,	39·5°
Highest mean temperature	2nd,	75°
Lowest " "	26th,	50·5°
Monthly " "		60·31°
Monthly range		46°

Pluviameter—

Days rain fell		5	
Greatest rainfall	22nd,	1·9	inches.
Total precipitation		1·312	"

Anemometer—

	N.	E.	W.	S.	NE.	NW.	SE.	SW.
Direction of wind..	6	8	7	4	12	7	5	6 times.

Greatest number of miles travelled in 24 hours ..	14th,	808	miles.
Greatest velocity per hour	14th,	48.5	"
Mean for the month		8.789.	

Clouds—

Cloudy days 16
Clear days 11
Mean cloudiness for the month 6.6

Remarks—

September opened warm and sunny, continuing so up to the middle of the month. The barometric pressure was high but unsteady, and the winds variable, the weather being for the most part mild and pleasant. On the 13th rain fell to the depth of ·4 inches, when the wind varied from south-east to east.

The morning of the 14th was cloudy, with a low barometer and a south-west wind, which increased during the day to a fresh gale, veering to the northwest towards evening. It then moderated, being accompanied by a fall in the temperature, this was followed by a few days of pleasant weather when the wind varied from south to south-west.

During the 21st, 22nd, and 23rd, the weather was again unsteady, with cooler weather and a rainfall of ·01, 1·9 and ·001 inches respectively.

The last week was very pleasant with a light breeze from the north-east and east, and a local shower on the 27th. During this week the atmospheric pressure was steady. The reading of the barometer was as high as 29·270 and did not fall below 29°.

October.

Barometer—

Highest barometer	6th, 2 p.m.,	29·172	inches.
Lowest "	9th, 7 a.m.,	28·562	"
Highest mean barometer	3rd, ...	29.146	"
Lowest " "	9th, ...	28·654	"
Monthly " "		28·911	"
Monthly range		0·610	"

Thermometer—

Highest temperature	
Lowest "	7th, 79°
Highest mean temperature	25th, 30°
Lowest " "	7th, 63·7°
Monthly mean temperature	20th, 42·8°
Monthly range	52·8°
	49·0°

Pluviameter—

Days rain fell	
Greatest rainfall	2, 1·126 inches.
	14th, 1·20 "

Anemometer—

	N.	E.	W.	S.	N.E	N.W.	S.E.	S.W.	
Direction of winds..	6	6	7	7	7	5	6	14	times.

Greatest number of miles travelled in 24 hours...... 9th, 594·7
Greatest velocity per hour ....
Mean for the month .... 9·82486

Clouds—

Cloudy days 14
Clear days 11
Mean cloudiness for the month 6.4

Remarks—

October opened with a high pressure and a pretty steady temperature, the weather being very pleasant and continuing so during the whole month. October, usually a rainy month, was this year remarkable for its dryness. There were only two days of rain; one on the 14th, when it fell to the depth of 1·20 inches, and the other on the 31st when it fell to the depth of 0·06 inches. This remarkably dry October has given a check to the growth of fall wheat. The prevailing winds were from the south-west.

November.

Barometer—

Highest barometer .... 2nd, 9 p.m., 29·410 inches.
Lowest " .... 24th, 7 a.m., 28·376 "
Highest mean barometer .... 2nd, ... 29·364 "
Lowest " " .... 23rd, ... 28·595 "
Monthly " " .... 28·948 "
Monthly range .... 1·034 "

Thermometer—

Highest temperature .... 11th, 67°
Lowest " .... 30th, 11·5°
Highest mean temperature .... 11th, 56·8°
Lowest " " .... 30th, 21°
Monthly " " .... 34·06°
Monthly range .... 55·5°

Pluviameter—

Days rain fell .... 5, 0.565 inches.
Greatest rainfall .... 12th, 0·41 "
Days snow fell .... 1, 6·0 "
Greatest snowfall .... 27th, 6.0 "
Total precipitation .... 1·165 "

Anemometer—

	N.	E.	W.	S.	N.E.	N.W.	S.E.	S.W.	
Direction of wind..	2	9	15	1	21	5	7	14	times.

Greatest number of miles travelled in 24 hours ...... 13th, 1066·6
Greatest velocity not observed.
The mean velocity for the 13th was .... 44·4
Mean velocity for the month 10.498

Clouds—

Cloudy days 20
Clear days 6
Mean cloudiness for the month .... 4·45

Remarks—

The first days of November were beautiful, with a wind varying from west to north-west and north-east, and a clear sky and even temperature.

From the 5th to the 15th the sky was overcast, the temperature continuing steady. During this time we had occasional mists and slight showers of rain.

The latter half of the month was frosty and the sky overcast. On the 26th we had the first snow storm and the first sleighing of the season.

This month has been very pleasant and remarkably free from early frosts and wet weather.

December—1st to 15th.

Barometer—

Highest barometer .... 3rd, 9 p.m., 29·080 inches.
Lowest " .... 13th, 2 p.m., 28·258 "
Highest mean barometer .... 8th, ... 28·988 "
Lowest " " .... 13th, ... 28.374 "
Monthly " " .... 28·728 "
Monthly range .... 0·822 "

Thermometer—

Highest temperature .... 4th, 50°
Lowest " .... 8th, 4°
Highest mean temperature .... 4th, 34.5°
Lowest " " .... 8th, 8°
Monthly " " .... 22°
Monthly range .... 46°

Pluviameter—

Days snow fell	5, 16	inches.
Greatest snowfall	10th, 6	"
Total precipitation	1·6	"

Anemometer—

	N.	E.	S.	W.	N.E.	N.W.	S.E.	S.W.
Direction of wind..	2	2	0	11	2	9	2	13 times.

Greatest number of miles travelled in 24 hours	13th, 590	miles.
Greatest velocity per hour	7th, 32	"
Mean for the month	13·5	"

Clouds—

Cloudy days	13
Clear days	none.
Mean cloudiness for the month	3

Remarks—

This month has been so far cloudy, accompanied by variable winds and snow storms. One heavy snow storm occurred on the 10th, when snow fell to the depth of 6 inches. On the evening of the 7th it stormed furiously. The temperature has been fairly steady, except upon the two occasions of the maximum and minimum readings, when it rose and fell remarkably. The mean temperature of the day before the maximum was taken was 25°. The barometer has been very steady, and the range consequently small.

MEAN METEOROLOGICAL RESULTS FOR THE YEAR 1882.

———	1882. Guelph.	Average of 40 years. Toronto.
Barometer—		
Mean pressure for the year	29·214	29·616
Month of highest mean pressure	January.	September.
Highest mean, monthly	29·424	29·664
Lowest " "	28·207	29·572
Month of the lowest mean	April.	June.
Date of the highest pressure in the year	August 18th.	
Highest pressure	29·988	30·358
Date of the lowest pressure in the year	July 6th.	
Lowest pressure	28·000	28·692
Range of the year	1·988	1·668
Thermometer—		
Mean temperature of the year	44°	44·17°
Warmest month	July.	July.
Mean temperature of the warmest month	66·9°	67·64°
Coldest month	January.	February.
Mean temperature of the coldest month	20·5	22·73°
Warmest day	July 26th.	
Mean temperature of the warmest day	75°	77·85°
Coldest day	January 24th.	
Mean temperature of the coldest day	—7·5	—1·50°
Date of the highest temperature	July 26th.	
Highest temperature	88°	91°
Date of lowest temperature	January 24th.	
Lowest temperature	—22	11·9°
Range of the year	110	102·0°

MEAN METEOROLOGICAL RESULTS FOR THE YEAR 1882—*Continued.*

——	1882. Guelph.	Average of 40 years. Toronto.
Pluviameter—		
Total depth of *rain* in inches	18·24	28·30
Number of days on which *rain* fell	67	110
Month in which the greatest depth of *rain* fell	August.	September.
Greatest depth of *rain* in one month	3·78	3·55
Month with most *rainy* days	August.	October.
Greatest number of *rainy* days in one month	11	13
Day on which the greatest amount of *rain* fell	22nd Sept'r.	
Greatest amount of *rain* in one day	1·9	1·98
Total depth of *snow* in inches	57·25	
Number of days on which *snow* fell	31	
Month in which the greatest depth of *snow* fell	December.	
Greatest depth of *snow* in one month	16·0	
Month with most *snowy* days	March.	
Greatest number of *snowy* days in one month	11	
Day on which the greatest amount of *snow* fell	Nov. 27th. Dec. 9th.	
Greatest amount of *snow* in one day	6·0	
Total precipitation in inches	22·96	

Your obedient servant,

R. B. HARE,

Professor of Chemistry and Lecturer on Geology and Meteorology.

PART III.

REPORT

OF THE

PROFESSOR OF BIOLOGY.

ONTARIO AGRICULTURAL COLLEGE,
December 31st, 1882.

To the President of Ontario Agricultural College:

SIR,—I have the honour to present to you the first report of work done in the Biological department in connection with the Ontario Agricultural College. Hitherto the work of this department has been divided between two Professors, with the result, that owing to their own proper work occupying the greater portion of their time and attention, this department did not receive as much notice or care as its importance warranted, although those to whom it was entrusted bore their extra burden in a most praiseworthy manner.

The department, as existing in this College, embraces several sub-departments, those portions of the science having a more important bearing on Agriculture being advanced to that degree. To illustrate my meaning it will perhaps be well to enumerate the various sub-departments, stating briefly the aim of each. In the first year a student receives lectures in the sub-departments of Zoology and Botany. Now these, in reality, include the entire science of Biology, but as recognized here merely embrace the rudiments of the study, which, when thoroughly mastered by the student, will enable him to proceed intelligently with the studies of branches of much more importance from an agricultural point of view. In the second year there is, first, a course on Entomology, in which the various injurious and beneficial insects are described as to their appearance, habits, etc., and the mode of preventing the ravages of the former; second, Economic Botany, in which the various plants furnishing mankind with food, clothing, luxuries, etc., are considered, as well as the methods by which these products are obtained; third, Systematic Botany, in which the student learns the characters of the more important orders of plants, and is shewn as far as possible the various plants indigenous to Canada, and taught to recognize them; fourth, Horticulture is also included in the department. By this, however, is meant Horticulture from a theoretical point of view, the points taken up being the physiological phenomena accompanying, and upon which the various operations are based, as will be seen by a glance at the detailed synopsis of the course of lectures given elsewhere, from which also a better idea of the points touched upon in the lectures of the various sub-departments will be obtained.

In addition to these subjects—the proper work pertaining to the department—I delivered a number of lectures on English Literature and English Composition, the majority in fact of the lectures given in the English Department.

During the past year I experienced some difficulty in preparing my lectures, being obliged to select certain subjects for explanation and detailed description, neglecting or merely touching others which were of quite as much importance in some cases as those treated of. The necessity for this procedure arose from the impossibility of overtaking the entire subject of Biology satisfactorily in a two years' course, and also from the small amount of time the student is enabled to spend at each subject owing to the multiplicity of studies he has to occupy his attention, I therefore became curious to ascertain, more fully than I had hitherto done, how the department was conducted in other agricultural institutions, and for that purpose made a study of the curricula of the various colleges at my disposal. As a result of these investigations, I find that, in the first place, the various subjects of the department are divided up among several professors, and, secondly, which I wish to lay stress upon, the course is invariably either of *three* or *four* years, and the various studies are spread over these, so that the student not only does more work than he does here but does it more thoroughly and with greater benefit to himself. But not only is more time a necessity, but practical work is also; for without this the student cannot study with any great degree of satisfaction, while with it he has more interest in his work, more easily understands the lectures, and more readily retains the facts which are told him. Now, in a large class of sixty or seventy, practical biological work is difficult even if there were time and apparatus for so large a number of students.

In order, then, to overcome these various difficulties, and make not only the biological course but the others also more beneficial and interesting, I would beg to make the following suggestion, which would perhaps come more appropriately from the President, but which, as closely concerning the future success of my department, I feel myself entitled to make. My suggestion is as follows :—Let the course be increased to three years. During the first two years the student should be obliged to pursue the same studies as at present, and if, at the conclusion of his second year he succeed in passing an examination in the various studies, he then be allowed to specialize. For this purpose the third year course might be divided into various departments, such as Agriculture, Horticulture, Veterinary Science, Biology, Chemistry, and Mathematics, one or more of which the student might be allowed to pursue, receiving instruction in the higher and more practical portions of that study. In my own department, for instance, the student would enter more fully into the Physiology of Plants, performing various experiments for himself; he would follow out, by the aid of the microscope, the life-history of the various fungi which are injurious to economic plants, such as Rust, Black Knot, etc., and thus gain an insight into the methods to be pursued in such studies. Again, his Entomological studies might be pursued still farther, collection and identification of various species of insects forming the basis of his work, as well as experiments to discover the best and cheapest method of preventing the ravages of injurious forms, for which of course a complete knowledge of the life-history and habits would be necessary as a preliminary. In the other departments courses of equal interest and benefit might be followed, and thus the third year would be made really the most instructive of the course. I am of the opinion that such an arrangement would be for the best advantage of the College, and through it to the community at large, and therefore I submit it to your consideration.

The Museum.

It falls to my lot also, as Curator, to report upon the state of the Museum. To this important department, I am happy to say, some additions have been made during the past year. In the first place, I must mention several cases of insects deposited by Mr. Arthur Nicol, the contents of which have since been for the most part identified, and which, with the specimens originally in the Museum, embrace most of our common and some of the rare Canadian forms. Through the kindness of our Professor of Agriculture, Mr. Brown, we have also been enabled to obtain possession of a fine specimen of *Alligator Mississippiensis*, and some other specimens of Southern fauna, and lately the same gentleman has added to our Agricultural section a valuable collection of Manitoba products, soils, etc. One of our late students presented me with some curious seeds belonging to several Jamaica plants, which I have placed in the Botanical section, and to the Zoological collection I have had the honour of adding a few specimens illustrating the Canadian reptilian fauna.

So much for the Agricultural and Biological sections. The Geological section has received a valuable addition in the shape of a fine collection of minerals, over one hundred in number, obtained from Messrs. Ward and Howell, of Rochester, N.Y., a long felt want being thus supplied.

The past year, accordingly, has been to the Museum a comparatively prosperous one, but there are still many important objects that ought to be found in the museum of an Agricultural College which are yet wanting. We should have, for instance, our fine collection of farm products from various parts of Canada supplemented by a collection of fruits, etc., and also by a collection of abnormalities and diseased products.

Secondly, we are in great want of a good collection of Canadian birds. This would be exceedingly instructive, as students might then be taught to recognize those birds which are destructive and those that are beneficial.

And, thirdly, although possessing an average collection of insects, we are entirely destitute of a collection of larval forms. Such a collection is of even more importance, from an agricultural point of view, than one of mature insects, for in the majority of cases it is the larvæ which destroy vegetation. A very interesting and instructive collection might be made by combining the mature insect, the larva, and a specimen showing the nature of the injury perpetrated by the latter or former, as the case might be. Thus, for instance, one example would be a specimen of the Pine-borer *(Monohammus confusor)*, the boring grub, and a piece of wood showing the galleries eaten out by the pest. I think it is patent to every one that such a collection could not fail to be of great educational value.

Many additions in each of these groups might be readily made, and I would call upon our various friends throughout the country to assist us in this matter. I made an appeal to the students last spring with a certain amount of success, and I now wish to extend it still farther. In the country many valuable examples of ravages occasioned by our insect foes may be obtained, for instance, when chopping in winter, examples of the galleries of borers may be met with, or even the borers themselves, and many important and useful objects might be brought to the notice both of the students and the farming community at large by sending them to our Museum.

Appended to this report will be found a catalogue of the specimens at present in the Museum.

Private Investigations.

There is one more subject that requires notice in this report—my own private work and investigations. Concerning these, I regret to say, I have not much to report. As will be seen from the commencement of this report, the subjects upon which I lecture are comparatively numerous, and the lectures must necessarily occupy considerable time, outside that taken up in their delivery, in preparation; and also the want of a proper laboratory has militated very largely against the performance of any series of experiments or the conducting of any series of investigations.

Notwithstanding these obstacles to private study, I have been able to do a certain amount of work outside that actually incumbent on my position. In the first place, on my entry upon the duties of Curator of the Museum, I found that much was required in the way of arrangement and naming of specimens; to these necessities I gave my attention, and succeeded to a certain extent in overcoming the confusion, though there is much yet to be done.

In addition to this I succeeded in carrying on certain investigations on two subjects. Professor Brown desired me to report upon the diameter and structure of a certain number of wools of different varieties of sheep, and after a series of microscopical examinations extending over several weeks, I presented him with a letter containing the results. Concerning these, however, I need say no more here, as they have already appeared in the Advance Report published some months previous.

The other subject to which I referred above was the fungus which is the cause of the disease known as "Black Knot," and although my studies did not result in the discovery of any new points in the life-history of this interesting form, nor clear up in any degree the points still involved in obscurity, still it may be interesting and instructive to review its life-history as at present known.

As above stated, the disease is due to the presence of a fungus, known technically as *sphæria morbus*. A fungus may be considered as consisting of two portions, viz., a *vegetative* portion, whereby the plant obtains nutriment from the structure on which it lives, and a *reproductive* portion whereby the species is perpetuated and extended. The latter is dependent upon the former, for without a proper supply of nourishment it is not possible for the plant to mature, or in other words to form its organs of reproduction. I shall, accordingly, first describe the structure and function of the vegetative organs.

Imbedded in the wood of the "knot" at an early stage may be found numbers of small clear silk-like threads, very minute and observable only by the aid of the microscope. These ramify amongst the cells which compose the tissue of the inner bark of the tree, and absorb from them nutriment which has been elaborated by the roots of the tree from the soil, and is usually known as sap. The fungus injures the tree by taking away from it nutriment which would otherwise go to form fruit and wood, and thus undermines its strength and vigour. The whole of the knot, however, is not composed of these fine threads, which eventually become matted together to form what is known as "false tissue," but is formed largely by an increased growth of the tissues in that part, a portion of the nutriment formed by the leaves and roots being diverted from its natural and proper use for this purpose. The process may in fact be likened to what occurs in our own bodies when any foreign matter is introduced beneath the skin. Inflammation ensues, resulting in swelling, caused by increased proliferation of the cells composing the injured parts. Accordingly, the fungus is injurious in two ways; 1st, by absorbing a certain amount of nutriment from its "host," and, 2nd, by diverting the nutriment from its proper use to form a knot or useless mass of tissue. The origin of the fungus is the seed, or what are technically termed "spores," which are afterwards to be described. These falling upon a tree, are nourished by moisture and heat, and sprout, sending off one of the threads which penetrates in between the cells of the "host," and branches abundantly. In the following spring these threads, which have been growing vigorously, and which have matted together into the false tissue, and the overgrowth of the tissues of the tree, burst through the bark. The knot-like mass grows rapidly, the fungus deriving an excess of nourishment from the rich ascending sap, and soon reaches its full size, which varies from one to six inches in length, and from two-fifths to one and a fifth deep.

The fungus now proceeds to make provision for its perpetuation and dissemination by the formation of reproductive organs or "spores." These, as in many other fungi, are of different varieties, one kind being produced at one season of the year and another at another.

First of all, in the spring and summer, after it has become mature, the knot becomes somewhat velvety in appearance, this being due to the vegetative threads sending up myriads of short jointed filaments which stand out upon the surface. If one of these be examined by the microscope it will be seen to bear one or two egg-shaped pointed spores, technically known as *conidiospores*, the little filaments being termed *conidia*. These *conidiospores* are exceedingly small, and fall off when ripe with the slightest touch, and are so light that the smallest breath of wind will carry them some distance. Falling in this manner on other trees, or on another spot on the same tree, and being supplied with moisture, they will germinate, and eventually produce another knot. Their formation continues until late in the summer, when the filaments which bear them wither away and disappear.

At this time another set of spores begins to be formed, but requires the greater part of the winter to come to perfection, reaching that state about February. If, during the winter, the surface of the knot be examined, it will be found to be covered with minute pores. An exceedingly thin section through one of these, being placed under the microscope, it is seen that these pores open into a cavity, the walls of which bear (1st) a large number of slender filaments, scattered among which are (2nd) club-shaped structures, termed *asci*, from a Greek word signifying a basket or receptacle. If the winter be well advanced these will be seen to contain a number of ovate bodies termed *ascospores*, which, when ripe, pass out of an opening which forms at the extremity of each *ascus*, and so escape. Falling in a suitable place, these germinate similarly to the *conidiospores* and produce knots.

Such are the contents of the majority of the cavities, but among them will be found a certain number which contain other structures. Some will contain very minute spores divided apparently into four chambers, and borne on the extremity of delicate filaments. These are termed *stylospores*. Their function is as yet unknown, but in all probability they constitute another variety of reproductive organ.

Other cavities contain exceedingly slender filaments termed *spermtia*. These have never been seen to germinate, but from their close resemblance to structures occurring in other fungi closely related to *sphœria morbus* which have been seen to do so, it is probable that they too are reproductive, and that from their exceeding minuteness "they are the agents for the dissemination of the species to a distance."

Lastly, other cavities are lined with short delicate filaments which end in a minute oval hyaline body; these small structures are formed in immense numbers, and ooze out from the cavities in which they grow in long jelly-like masses. These are the *pycnidio-spores*, and, like the spermatia, their function, as far as the fungus under consideration is concerned, is doubtful, but the probability is that they have a similar function to those structures.

We thus see that in this fungus we have no less than five different varieties of reproductive organs, viz.: *conidiospores*, *ascospores*, *stylospores*, *spermatia*, and *pycnidio-spores*, and hence the perpetuation and extension of the disease is inevitable, unless measures to combat it are taken promptly upon its appearance. The variety of spores, or at any rate the enormous number of them, is characteristic of all parasitic fungi, and also parasitic animal forms, and is a provision of nature to ensure their perpetuation. For organisms, whose mode of life is of this nature, are manifestly at a disadvantage as far as the dissemination of the species is concerned, there being difficulties in the way of the spores falling in situations favourable to their development. Ordinary plants have the entire surrounding country in which their seeds can grow, while with parasitic fungi there are only one or two plants upon which each one will grow. For instance, "Black Knot" only attacks plums and cherries, "ergot" only rye and a few grasses, "rust" only wheat and oats, one variety of "smut" only wheat, and another only Indian corn. Myriads of the spores are consequently wasted, not being carried to another "host" of the same species as that from which they came, while others again, though meeting a proper "host," do not receive the necessary amount of heat and moisture to cause them to develop.

As regards the means to be adopted for the destruction of the disease, of course there can be nothing, as far as the individual trees are concerned, as useful as its complete extirpation by the knife, and the use of salt to cover the wound and aid in the destruction of any filaments that may have escaped the knife. But there is one point which I think should be insisted upon very strongly, namely, that the knot when cut out ought not to be merely thrown aside, but should be immediately burned. If this be not attended to the remedy will have only a partial effect, for the result will be that the fungus, being deprived of a proper supply of nourishment, will immediately apply that which it has obtained to the production of spores, just as any fruit will ripen more rapidly when cut off from the tree which bears it. The spores, being formed, will immediately be carried about by the wind, which is the principal agency in their dissemination, their exceeding minuteness rendering them peculiarly fitted for being carried long distances, and the disease will thus spread almost as rapidly as if it were neglected. Burning is an important agent in the destruction of the fungus, and should on no account be neglected.

The most suitable time for cutting out the knot depends altogether on what stage it is in. Of course the proper time is immediately it is noticed, and before it can have time to form spores, but frequently attention is not paid to it for some time, the cultivator being occupied with other matters, and accordingly a definite time should be set aside for its destruction. Now, as we have seen the *ascospores* and others become ripe in February, and the *conidiospores* in the following summer, so that the winter or late fall would be the preferable times if any are to be appointed. I would again state that it is the duty of every cultivator to eradicate the disease and burn the knots as soon as they appear.

In conclusion, I would point out the great necessity of proceeding at once with the erection of new conservatories and a botanical laboratory. Without the latter it cannot be expected that any satisfactory work can be done, while with it many important investigations might be carried on, important not only from a scientific point of view, but also to the practical farmer.

I have the honour to be, Sir,
Your obedient servant,

J. Playfair McMurrich,
Professor of Biology and Horticulture.

CATALOGUE OF MUSEUM.

Ontario Agricultural College.

A. Agricultural Section.

1. Specimens of Canadian wheats:

(1) Deihl wheat.
(2) Deihl fall wheat.
(3) White wheat.
(4) Soulis wheat.
(5) Farrow wheat.
(6) Golden drop wheat.
(7) Club wheat.
(8) Mammoth wheat.
(9) Rio Grande wheat.
(10) Fyfe wheat.
(11) Glasgow wheat.
(12) Scotch wheat.
(13) Red chaff wheat.
(14) Scott fall wheat.
(15) Seneca fall wheat.
(16) Mediterranean wheat.
(17) Black Sea wheat.
(18) Blue stem fall wheat.
(19) Western spring wheat.
(20) Wick's spring wheat.
(21) Manitoba wheat.

2. Specimens of Canadian barleys:

(1) Hulless barley.
(2) 6-rowed barley.
(3) Black barley.
(4) 4-rowed barley.
(5) 2-rowed barley.

3. Specimens of Canadian oats:

(1) Black or Tartarian oats.
(2) Black Poland oats.
(3) Black Brunswick oats.
(4) Black Norway oats.
(5) Bearded Tartarian oats.
(6) Common white oats.
(7) Large white oats.
(8) Sparable black oats.
(9) Surprise oats.
(10) Bohemian oats.
(11) White blade oats.
(12) Sparable white oats
(13)
(14) Hopetoun oats.
(15) Australian oats.
(16) Potato oats.
(17) Emporium oats.
(18) Californian oats.
(19) Side oats.
(20) Middleton oats.
(21) New Zealand oats.

4. Specimens of Canadian ryes.

5. Specimens of Canadian Buckwheats:

(1) Common buckwheat.
(2) Siberian buckwheat.
(3) Silver hull.

6. Specimens of Canadian peas:

(1) Small field peas.
(2) Small white peas.
(3) Hybrid white peas.
(4) Gold drop peas.
(5) Golden vine peas.
(6) White marrowfat peas.
(7) Black eye marrowfat peas.
(8) Irish marrowfat peas.
(9) June peas.
(10) Early June peas.
(11) Excelsior peas.
(12) California peas.
(13) Dan O'Rourke peas.
(14) Crown peas.
(15) Multiplier peas.
(16) Early Washington peas.
(17) Shady vine peas.
(18) Creeper peas.
(19) Caractus peas.
(20) Grass peas.
(21) Tom Thumb peas.
(22) Aberdeen peas.
(23) Brown peas.
(24) Prince Albert Peas.
(25) Blue fill-basket peas.
(26) Blue Imperial peas.
(27) Blue Prussian peas.
(28) Philadelphia peas.
(29) European peas.
(30) Champion of England peas.

CATALOGUE OF MUSEUM—*Continued.*

7. Specimens of Canadian beans:

(1) White field beans.
(2) Marrowfat beans.
(3) Small white beans.
(4) Dwarf white wax beans.
(5) Small marrowfat beans.
(6) White kidney beans.
(7) Six week beans.
(8) Early China beans.
(9) Butter beans.
(10) White marrowfat beans.
(11) Large white beans.
(12) Navy field beans.
(13) Small field beans.
(14)
(15)
(16) Black butter beans.
(17) Bush butter beans.

8. Specimens of Canadian tares.

9. Specimens of Canadian vetches.

10. Specimens of Canadian flours:

(1) Coarse shorts.
(2) Shorts.
(3) Bran.
(4) Coarse Graham flour.
(5) Fine Graham flour.
(6) Granulated wheat.
(7) Spring wheat flour.
(8) Superior flour.
(9) Snowflake flour.
(10) Farmer's grist.
(11) Strong baker's flour.
(12) Superfine flour.
(13) Extra flour.
(14) Super. extra flour.
(15) XXX super. extra flour.
(16) Extra white flour.
(17) Family flour.
(18) Extra family flour.
(19) Buckwheat flour.

11. Specimens of Canadian oatmeals:

(1) No. 1 coarse oatmeal.
(2) No. 2 medium oatmeal.
(3) No 3 fine oatmeal.
(4) Fine oatmeal.
(5) Standard oatmeal.

12. Specimen of Canadian corn meal.

13. Specimens of Canadian wild rice:

(1) Natural state. (2) Parched wild rice.

14. Specimens of Canadian beet seeds:

(1) Long blood beet.

15. Specimen of Canadian carrot seed.

(1) White Belgiam carrot.

16. Specimen of Canadian turnip seed:

(1) Gripstone turnip.

17. Specimens of Canadian millet seed:

(1) Common millet. (2) Broom corn millet. (3) Chinese millet.

18. Specimens of Canadian fodder seeds:

(1) Timothy. (2) Clover. (3) Hungarian grass.

19. Specimens of Canadian flax seeds.

20. Specimens of Manitoba produce:—

(1) Winter wheat; sown Sep. 1881, appeared above ground May 1st, 1882, cut August 14th, 1882; near Edmonton.

(2) Wheat from Edmonton; yields 17½ bushels for every bushel sown.

(3) Club wheat from Geo. Rath's farm, Edmonton.

CATALOGUE OF MUSEUM—*Continued.*

(4) Club wheat from farm of Mr. James Gullen, Edmonton.
(5) Club wheat, harvested August 29th, 1882, from farm of Mr. Price, near Edmonton.
(6) Club wheat from Fort Victoria.
(7) Winter wheat from Mr. Barwick's farm, near Edmonton.
(8) Wheat from farm of Stipendiary Magistrate, Lieut-Col. Richardson, at Battleford.
(9) Wheat sown in spring of 1882; Edmonton.
(10) Fyfe Wheat from Prince Albert.
(11) Stool of wheat from single grain; from farm of Chief Factor Hudson Bay Co., Edmonton.
(12) Bearded wheat sown May 1st, harvested August 29th, yielding over 30 bushels to the acre. From farm of W. Barwick, near Edmonton.
(13) Bearded wheat from Mr. Price's farm near Edmonton; cut August 29th, 1882.
(14) Wheat from bad grain.
(15) Barley from Mr. Price's farm, near Edmonton.
(16) Barley from Donald Ross' farm, Edmonton.
(17) Barley from Geo. Rath's farm, Edmonton; sown May 27th, harvested August 24th, 1882.
(18) Barley from farm of John Peacock, Edmonton.
(19) Six-Rowed barley, sown first week in July, cut Aug. 28th. D. McLeod's farm, Edmonton.
(20) Oats from farm of Donald Ross, Edmonton.
(21) Oats from farm of Donald Ross, Edmonton.
(22) Head of oats, contained 546 grains when lifted.
(23) Rocky Mountain rye; stool from one grain. From farm of John Peacock, Edmonton.
(24) Field peas; from D. Ross, Edmonton.
(25) Wild peas; natural growth, from Clover Bar.
(26) Potatoes from Edmonton.
(27) Prairie grass; natural growth. From Clover Bar, 7 miles from Edmonton.
(28) Wild hops. Edmonton.
(29) Wild vetches; natural growth. Clover Bar District, 7 miles from Edmonton.
(30) Coal from Edmonton.
(31) Coal from Pelly River District.
(32) Iron ore boulder; from Mr. Tanner's farm, Edmonton.
(33) } Soils from Edmonton.
(34) }

21. Models of Agricultural Implements, from Hohenheim, Germany:

(1) Hohenheim plough. Construction A.
(2) Hohenheim plough. Construction B.
(3) Hohenheim plough. Construction C.
(4) Hohenheim plough. Construction C*
(5) Hohenheim plough. Construction D.
(6) Sub-soil plough.
(7) Roville harrow.
(8) Harrow, adjustable.
(9) Brabant harrow.
(10) Drill, single.
(11) Sowing and harrowing machine.
(12) Roller, with three cylinders.
(13) Marker.
(14) Ditching plough.
(15) Horse cultivator, with seven teeth.
(16) Hand water waggon.
(17) Horse scoop.
(18) Improved Corn mill, from Berne.
(19) American machine for removing corn from cob.
(20) Turnip cutter.
(31) French wheat cleaner; removes cockle.
(22) Hohenheim fruit press.
(23) Improved Swabian cider press.
(24) Esslingen grape press.
(25) Press for manufacturing drain tiles.
(26) Heilbronn grape press.
(27) English hand flour-mill.
(28) Crib for feeding sheep.
(29) Frame for drying grain.
(30) Williams' draining shovels.
(31) Hoe-shovel.
(32) Instrument for planting potatoes, etc.
(33) Spinning wheel.

CATALOGUE OF MUSEUM—*Continued.*

22. Models of Agricultural Machines, manufactured by Borrosch & Jasper, Prague, Austria. These, owing to the absence of the manufacturers' catalogue, cannot be classified.
23. Bee-hive.
24. Head of steer, pure Devon.
25. Head of Boar, Windsor.

B—Veterinary Section.

1. Model of Horse in papier maché.
2. Model of Cow in papier maché.
3. Model of Horse in plaster of Paris, showing muscles.
4. Specimen of Tubercular deposit on vocal cords of cow.
5. Specimen of Post-pharyngeal abscess in cow.

C—Biological Section.

I.—*Botanical Sub-section.*

1. Case, containing 100 varieties of wood:—

(1) Acer campestre, L.
(2) Acer dasycarpum, L.
(3) Acer Negundo, L.
(4) Acer platanoides, L.
(5) Acer pseudoplatanus, L.
(6) Acer saccharinum, L.
(7) Acer tartaricum, L.
(8) Æsculus hippocastaneus, L.
(9) Æsculus rubicunda, Lois.
(10) Ailanthus glandulosa, L.
(11) Alnus glutinosa, W.
(12) Aluns incana, W.
(13) Amelanchier botryapium, Dec.
(14) Amorpha fruticosa, L.
(15) Amygdalus communis, L.
(16) Abies excelsior, D.
(17) Abies pectinata, D.
(18) Betula alba, var.
(19) Betula alba, L.
(20) Bignonia catalpa, L.
(21) Carpinus betulus, L.
(22) Castanea vesca, G.
(23) Cornus mascula, L.
(24) Celtis Australis, L.
(25) Celtis crassifolia, L.
(26) Cercis Canadensis, L.
(27) Cornus alba, L.
(28) Cornus sanguinea, L.
(29) Corylus avellana, L.
(30) Cratægus oxyacanthus, L.
(31) Cytisus alpinus, L.
(32) Elæagnus hortensis, Bieb.
(33) Fagus sylvatica, L.
(34) Fraxinus excelsior, L.
(35) Fraxinus Americana, L.
(36) Fraxinus pubescens, L,
(37) Gingko biloba, L.
(38) Gleditschia triacanthus, L.
(39) Gymnocladia Canadensis, Lam.
(40) Hippophaë rhamnoides, L.
(41) Ilex aquifolium, L.
(42) Juglans nigra, L.
(43) Juglans regia, L.
(44) Juniperus communis, L.
(45) Juniperus Virginiana, L.
(46) Kœlreuteria paniculata, Lax
(47) Larix Europœa, Dec.
(48) Ligustrum vulgare, L.
(49) Liriodendron tulipifera, L
(50) Morus alba, L.
(51) Morus papyrifera, L.
(52) Paalownia imperialis, Sieb.
(53) Pinus laricio—austriaca, T.
(54) Pinus cembra, L.
(55) Pinus cedrus, L.
(56) Pinus mughus, Jacq.
(57) Pinus strobus, L.
(58) Pinus sylvestris, L.
(59) Platanus acerifolia, W.
(60) Populus nigra, L.
(61) Populus tremula, L.
(62) Prunus avium, L.
(63) Prunus cerasus, L.
(64) Prunus domestica, L
(65) Prunus mahaleb, L.
(66) Prunus institia, L.
(67) Prunus spinosa, L.
(68) Prunus padus, L.

CATALOGUE OF MUSEUM—*Continued.*

(69) Prunus Virginiana, L.
(70) Ptelea trifoliata, L.
(71) Pyrus communis, L.
(72) Pyrus malus, L.
(73) Pyrus torminalis, Ehrh.
(74) Quercus cerris, L.
(75) Quercus pedunculata, S.
(76) Rhamnus catharticus, L.
(77) Rhamnus frangula.
(78) Robinia pseudacacia, L.
(79) Rhus cotinus, L.
(80) Rhus typhina, L.
(81) Sambucus nigra, S.
(82) Salix alba, L.
(83) Salix caprœa, L.
(84) Salix daphnoides, P.
(85) Salix viminalis, L.
(86) Sophora Japonica, L.
(87) Sorbus aucuparia, L.
(88) Sorbus domestica, L.
(89) Spartium scoparium, L.
(90) Spirœa opulifolia, L.
(91) Syringa vulgaris, L.
(92) Tamarix gallica, L.
(93) Taxus baccata, L.
(94) Tilia parvifolia, E.
(95) Thuja orientalis.
(96) Ulmus campestris.
(97) Ulmus effusa.
(58) Viburnum opulus.
(99) Vitis vinifera.
(100)

2. Twenty-two specimens of woods from California :

(1) White Ash, from Kansas.
(2) Peach.
(3) Castor Bean.
(4) Hickory.
(5) Black Walnut.
(6) Grape.
(7) Pea Bud.
(8) White Ash.
(9) Red Cedar.
(10) Kansas Pecan.
(11) Box Elder.
(12) Honey Locust.
(13) White Oak.
(14) Mulberry.
(15) Kansas Linden.
(16) Red Oak.
(17) Quaceing Ash.
(18) Wild Cherry.
(19) Osage Orange.
(20), (21), (22) } Pine Cones.

3. Section of the trunk of an oak.
4. Specimen of Cotton Plant (Gossypium herbaceum).
5. Gum from Australia.
6. Fibrous pod from the West Indies.
7. Herbarium of Canadian plants, in which are represented of Dicotyledons 76 orders, 243 genera, and 454 species; of Monocotyledons 12 orders, 82 genera, and 199 species; of Gymnosperms 1 order, 5 genera, and 5 species; of Cryptogamus 6 orders, 18 genera, and 40 species.
8. Herbarium of British plants.
9. Herbarium of German plants, including examples of 536 species.
10. Collection of agricultural grasses from Ireland, including examples of 25 genera and 48 species.
11. Series of botanical diagrams.
12. Seeds and pod of Catalpa syringœfolia.
13. Seeds of Sapindus saponaria, Soapberry, from W. I.
14. " Coix lacryma, Job's tears, from W. I.
15. " Abrus precatorius, from W. I.
16. " Melia azedarach, from W. I.

II.—*Zoological Sub-section.*

1. Thirteen casts illustrative of anatomy of human body.
2. Red Kangaroo, *Macropus laniger*.
3. Walabee Kangaroo, *Macropus ualabatus*.

CATALOGUE OF MUSEUM—*Continued.*

4. Emeu.
5. Collection of 25 birds' nests and eggs.
6. *Alligator Mississippiensis.*
7. Bones of Green Turtle, *Chelone midas.*
8. Carapace of Green Turtle, *Chelone midas*—2 specimens.
9. Milk-snake, *Ophibolus doliatus.*
10. Ring Snake, *Ophibolus getulus.*
11. Ring-necked Snake, *Diadophis punctatus.*
12. Little Green Snake, *Cyclophis vernatus.*
13. Green Frog, *Rana halecina.*
14. Common Toad, *Bufo vulgaris.*
15. Hermit Crab, *Eupagurus sp. ?*
16. King Crab, *Limulus polyphemus.*
17. Acorn Barnacle, *Balanus sp. ?*
18. Specimen of *Polyzoon.*
19. Sea Squid, *Loligo Pealii.*
20. Small collection of marine shells.
21. Sea Worm, *Nereeis sp. ?*
22. " Gen. et sp. (?)
23. Common Star-fish, *Asteracanthion.*
24. Star-fish from W. I., *Oreaster sp. ?*
25. Star-fish, *Brisinga sp. ?*
26. Sea Urchins, *Strongylocentrotus sp. ?*
27. Sand Dollars, *Echinarachnius parma.*
28. Brittle Stars, *Ophiolepis sp. ?*
29. Brittle Stars, *Ophiocomis sp. ?*
30. Jelly Fish.
31. White Coral, *Madrepora sp. ?*
32. Sea Anemone.
33. *Gorgonia sp. ?*
34. Venus' Fan, *Rhipidogorgia sp. ?*
35. Sponges, 3 varieties.
36. Series of zoological plates.
37. Series of Patterson's Zoological Diagrams.
38. Portion of Series of Marshall's Physiological Diagrams.
39. " Johnston's Illustrations of Natural Philosophy.

III.—*Entomological Sub-section.*

1. Four cases of insects.
2. Five cases of insects, presented by Mr. A. Nicol.
3. Silk from common silk worm, *Bombyx mori.*
4. Cocoons of common silk worm, *Bombyx mori.*
5. Cocoons of Canadian silk worm, *Cecropia.*
6. A few Lepidopterous larvæ.
7. A few Lepidopterous eggs.
8. Series of Entomological diagrams.

D—Geological Section.

I.—*Mineralogical Sub-section.*

1. Gold in quartz. California.
2. Gold nugget. El Dorado, California.
3. Silver. Freiburg, Saxony.

CATALOGUE OF MUSEUM—*Continued.*

4. Copper. Franklin Mine, Lake Superior.
5. Meteoric Iron. Bates County, Missouri.
6. Sulphur. Girgenti, Sicily.
7. Diamond. Kimberley Mine, South Africa.
8. Graphite. Ceylon.
9. Stibnite. Sarawak, Borneo.
10. Galenite. Cumberland, England.
11. Galenite. Galena, Illinois.
12. Sphalerite. Cumberland, England.
13. Sphalerite. Roxbury, Connecticut.
14. Cinnabar. New Almaden, California.
15. Pyrites. Isle of Elba.
16. Pyrites. Rowe, Massachusetts.
17. Cobaltite. Tunaberg, Sweden.
18. Marcasite. Folkestone, England.
19. Arsenopyrite. Freiberg, Saxony.
20. Molybdenite. Altenberg, Saxony.
21. Chalcopyrite. Gippsland, Victoria, Australia.
22. Halite. Stassfurt, Prussia.
23. Halite. Austria.
24. Sal-ammoniac in lava. Vesuvius.
25. Fluorite. Cumberland, England.
26. Fluorite. Cumberland, England.
27. Cryolite. Arksutfiord, Greenland.
28. Spinel. Amity, New York.
29. Magnetite. Port Henry, New York.
30. Magnetite, var. loadstone. Magnet Cave, Ark.
31. Chromite. Baltimore, Maryland.
32. Zincite. Franklin Furnace, New Jersey.
33. Corundum. North Carolina.
34. Corundum, var. emery. Naxos, Greece.
35. Hæmatite, var. specular iron ore. Elba.
36. Hæmatite, var. micaceous. Pennsylvania.
37. Hæmatite. Cleator Moor, Cumberland, Eng.
38. Hæmatite. Antwerp, New York.
39. Menaccanite. Cumberland, Rhode Island.
40. Cassiterite. Zinnwald, Saxony.
41. Rutile. Krageroë, Norway.
42. Pyrolusite. Langeberg, Saxony.
43. Limonite. Lake Superior.
44. Limonite, var. ochre. Cape Girardeau, Mo.
45. Brucite. Texas, Pennsylvania.
46. Hydrotalcite. Vernon, New Jersey.
47. Psilonielane. Langenstriegis, Saxony.
48. Quartz. Warstein, Westphalia.
49. Quartz. Rondout, New York.
50. Quartz, var. geode. Keokuk, Iowa.
51. Quartz, var. rock crystal. Little Falls, New York.
52. Quartz, var. rock crystal. Hot Springs, Arkansas.
53. Quartz, var. amethystine. Cumberland, England.
54. Quartz, var. milky quartz. Bedford, New York.
55. Quartz, var. rose quartz, Bedford, New York.
56. Quartz, var. amethyst. Lake Superior.

CATALOGUE OF MUSEUM—*Continued.*

57. Quartz, var. smoky quartz. Bedford, New York.
58. Quartz, var. chalcedony. Tampa Bay, Florida.
59. Quartz, var. chalcedony. Brazil.
60. Quartz, var. agate. Brazil.
61. Quartz, var. flint. Dover, England.
62. Quartz, var. jasper. Cambay, England.
63. Quartz.
64. Quartz, var. itacolumite. Danbury, North Carolina.
65. Quartz, var. silicified wood. Cairo, Egypt.
66. Opal. Hungary.
67. Opal, var. wood opal. Nevada, California.
68. Opal, var. Tripoli. Algeria.
69. Wollastonite. Amity, New York.
70. Pyroxene. Puy de la Rhode, Auvergne.
71. Jeffersite. Pennsylvania.
72. Amphibole. Chester, Massachusetts.
73. Amphibole, var. actinolite. Cranston, Rhode Island.
74. Amphibole, var. tremolite. Gouverneur, New York.
75. Amphibole, var. asbestos.
76. Cloth woven from asbestos.
77, Beryl. Middletown, Connecticut.
78. Chondrotite. Amity, New York.
79. Garnet. Redding, Connecticut.
80. Garnet. Ala, Piedmont.
81. Garnet in mica schist. Southbury, Conn.
82. Zircon. Buncomb Co., North Carolina.
83. Vesuvianite. Vesuvius.
84. Wernerite. Templeton, Canada.
85. Wernerite. Newtown, Connecticut.
86. Epidote. Sulzbachthal, Tyrol.
87. Epidote rock. Afton, Virginia.
88. Muscovite.
89. Muscovite, var. picture mica. Delaware Co. Penn.
90. Margarodite. Trumbull, Pennsylvania.
91. Phlogopite. Jefferson Co., New York.
92. Biotite. Edenville, New York.
93. Lepidolite. Rozena, Moravia.
94. Leucite in lava. Vesuvius.
95. Labradorite. Labrador.
96. Labradorite. Orange Co., New York.
97. Oligoclase. Arendal, Norway.
98. Albite. Pfitsch, Tyrol.
99. Microcline. Buo, near Arendal, Norway.
100. Microcline, var. Amazon stone. Pike's Peak, Cal.
101. Orthoclase. Carlsbad, Germany.
102. Orthoclase.
103. Orthoclase. Wilmot, New Hampshire.
104. Catlinite. Minnesota.
105. Kaolinite. Bedford, Indiana.
106. Indurated clay. Mt. Savage, Maryland.
107. Leopardite. Charlotte, North Carolina.
108. Obsidian. Lipari, Mediterranean.
109. Lava. Vesuvius, Italy.

CATALOGUE OF MUSEUM—*Continued.*

110. Pumice. Lipari, Mediterranean.
111. Andalusite, var. chiastolite. Rochester, N. H.
112. Topaz. Villa Rica, Brazil.
113. Staurolite. Goldenstein, Moravia.
114. Cyanite. Randolph Co., Alabama.
115. Tourmaline. Ramfossen, Norway.
116. Tourmaline. Randolph Co., Alabama.
117. Tourmaline. Alexandra Bay, New York.
118. Talc. Zillerthal, Tyrol.
119. Talc. Fowler, New York.
120. Talc, var. rensslaerite. Fowler, New York.
121. Serpentine. Vernon, New Jersey.
122. Serpentine. Waldstein, Saxony.
123. Serpentine. Harford Co., Maryland.
124. Ripidolite. Chester Co., Pennsylvania.
125. Masonite. Natic, Rhode Island.
126. Chrysocolla. Chanarcilla, Chili.
127. Calamine. Ogdensburg, New York.
128. Halite. Fassathal, Tyrol.
129. Chabazite. Rübendörfel, Bohemia.
130. Natrolite. Aussig, Bohemia.
131. Stilbite. Nova Scotia.
132. Wolframite. Zinnwald, Saxony.
133. Barite. Cumberland, England.
134. Barite. Cocke Co., Tennesee.
135. Barite. Derbyshire, England.
136. Celestine. Sicily.
137. Anhydrite. Nova Scotia.
138. Gypsum, var. selenite. Poland, Ohio.
139. Gypsum, var. selenite. Manlius, N. Y.
140. Gypsum, var. satin spar. Derbyshire, England.
141. Gypsum, var. alabaster. Castelina, Italy.
142. Gypsum. Windsor, Nova Scotia.
143. Apatite. Norway.
144. Apatite. Burgess, Canada.
145. Pyromorphite. Ramsbeck, Germany.
146. Wavellite. Garland Co., Arkansas.
147. Dufreynite. Rockbridge Co., Virginia.
148. Soda nitre. Tarapaca, Peru.
149. Sassolite. Sasso, Tuscany.
150. Calcite. Cornwall, England.
151. Calcite. St. Louis, Missouri.
152. Calcite, var. Iceland spar. Iceland.
153. Calcite, var. statuary marble. Italy.
154. Calcite, var. California marble. Suisan, Cal.
155. Calcite, var. Mexican onyx. Mexico.
156. Calcite, var. calcareous tufa. Niagara Falls.
157. Calcite, var. incrustation. Clermont, France.
158. Dolomite, var. pearl spar. Niagara Falls,
159. Dolomite. Westchester Co. New Jersey.
160. Siderite. Roxbury, Connecticut.
161. Arragonite. Bastenes, France.
162. Strontianite. Drensteinfurt, Prussia.

CATALOGUE OF MUSEUM—*Continued.*

163. Malachite. Burra Burra, Australia.
164. Natron. Natron Lake, Egypt.
165. Succinite. Konigsberg, Prussia.
166. Asphaltum. Trinidad.
167. Petroleum. Jebel Zeit, Egypt.
168. Ozocerite. Barislaw, Galicia.
169. Albertite. New Brunswick.
170. Mineral coal, var. anthracite. Lehigh Valley.
171. Mineral coal, var. native coke. Richmond, Va.
172. Mineral coal, var. cannel coal. Grayson, Ky.
173. Mineral coal, var. lignite. Grumden, Austria.
174. Mineral coal, var. jet. Wurtemburg.

There are also many other specimens as yet unidentified.

II.—*Geological Sub-section.*

Many specimens of rocks as yet unnamed.

III.—*Palæontological Sub-section.*

Many specimens illustrative of the Canadian fossil fauna, and flora as yet, however, unclassified.

E—Physical and Astronomical Section.

1. Smith's 10-inch celestial globe.
2. W. & A. K. Johnstone's 10-inch terrestrial globe.
3. Orrery.
4. Johnston's illustrations of natural philosophy.
5. Diagram of principles of optics.
6. Diagram of principles of hydraulics.
7. Diagram of principles of hydrostatics.

F—Educational Section.

1. French measures of capacity.
2. Series of geographical maps in frame.
3. Series of geographical maps in frame.
4. Series of geographical wall maps.

It is to be regretted that, owing to the short time at my disposal, the catalogue is not as complete as it ought to be, but still sufficient has been given above to afford an idea of the extent of our collections in the various departments, and to show wherein we are yet lacking.

Playfair McMurrich, M.A., Tor.,
Curator of Museum.

PART IV.

REPORT

OF

THE PHYSICIAN.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, December 19th, 1882.

To the Honorable S. C. Wood,
Commissioner of Agriculture for the Province of Ontario.

SIR,—At the close of another year I have the honour to present to you my Annual Report.

During the earlier months of the year we had a good deal of sickness. We had an epidemic of mumps of a metastatic type, and many of the young men were very ill. During this time quite a few of the young men who were not attacked with the mumps, suffered from an inflammatory condition of the throat. Following this we had scarlet fever of a bad type, which was prevented from spreading by the prompt removal of the young men attacked to the Guelph General Hospital, where they had every care and attention. and where they remained until they could return to the College with perfect safety to the other inmates. One of the scarlet fever patients was afterwards taken ill with albumenuria; but, with proper treatment, and care on his own part, made a good recovery.

We had one case of measles (servant girl), but by careful isolation it was prevented from spreading.

A few weeks ago one of the young men had his thigh broken. He is doing well, and will soon be about.

The last serious case this season is one of erysipelas of the head and face, and I am glad to be able to report him doing well.

There are many other cases I might mention, but they are just such as are met with in every day practice.

We have great reason to be thankful that, notwithstanding the very serious illness of some of the young men, we have not had a death this year.

What we require in connection with this Institution is properly isolated apartments for the sick, where, in case of epidemic, we could remove our patients at once, and thus guard against the spread of disease, and where the sick will be free from the noise and commotion that cannot be avoided in an Institution of this kind.

I have the honour to be, Sir,

Your obedient Servant,

E. W. MCGUIRE.

PART V.

REPORT OF COMMITTEE

CHARGED WITH THE OVERSIGHT OF

FRUIT AND FOREST PLANTING

AT THE

AGRICULTURAL COLLEGE, GUELPH.

GUELPH, November 23d, 1882.

To the Honourable the Commissioner of Agriculture:

SIR,—The Committee of the Fruit Growers' Association, charged with the duty of directing the operations in Horticulture and Forestry at the Agricultural College, Guelph, beg to submit the following report:

The orchard, begun in 1880, and extended in 1881, is in a healthy condition, and the trees are making as rapid growth on the whole as could be desired. It has been the aim of your Committee to make this orchard not only an experimental one, where shall be tested every variety of fruit at all likely to succeed in this climate, but also to grow therein a sufficient quantity of the most valuable varieties to give an ample supply for the use of the College.

APPLES.

There are now growing in the orchard six hundred and seventy apple trees, comprising ninety-two varieties. Those planted in largest quantity are Golden Russet, Roxbury Russet, Rhode Island Greening, Wagener, Northern Spy, Baldwin, Swayzie Pomme Grise, Snow Apple, Ribston Pippin, Talman Sweet, Mann Apple, Duchess of Oldenburg, Gravenstein, St. Lawrence, Alexander, Morton's Melon, Chenango Strawberry, Twenty Ounce, Early Harvest, Red Astracan, Keswie Codlin, etc., and of those more particularly intended as experimental, only two trees of a kind have been planted.

PEAR.

There are ninety-three pear trees now well established, comprising thirty-six varieties. Fifty-three trees were planted temporarily in nursery row, comprising sixteen sorts. These will be planted in the orchard next spring.

PLUMS AND CHERRY.

The portion devoted to plums contains sixty-six trees, comprising twenty-three sorts; and that set apart for cherries contains fifty-one trees, comprising eighteen sorts.

The Vineyard.

We are gratified in being able to say that the grape vines have done remarkably well, and while making a thrifty growth have matured their wood perfectly. There are now growing and well established, five hundred and thirty-six vines, comprising fifty-seven different varieties. These will soon come into bearing, and become an interesting opportunity for study and comparison, while at the same time yielding a supply of agreeable fruit for the College tables.

Small Fruits.

These yielded some fruit during the past summer, and although your Committee thought they had planted liberally of these, having put out over two thousand raspberry plants, and nearly four thousand of strawberry, yet it was found that the requirements of the College were far from being met. In addition to the raspberry and strawberry plantation there are three hundred and twenty-three gooseberry, and two hundred and twelve currant trees growing. These comprise twenty-one varieties of raspberry, thirteen of strawberry, three of gooseberry and four of currants.

Forestry.

The several clumps of Black Walnut, European Larch, Butternut, Sugar Maple and of mixed trees are doing fairly well, except that the group of Larch from some cause did not succeed, probably owing to the very dry character of the soil in which they were planted. There is, however, a sufficient number of young Larches in the nursery plot to supply all the vacancies. It was found desirable to use the field in which the clump of Ash had been planted as an experimental grain plot. On this account they have been taken up and will be set out in the other field next spring. The experiment of growing black Walnut, with and without cultivation, is already demonstrating the fact that the growth is much more satisfactory where clean cultivation with occasional stiring of the soil is practised. The nursery plantations of young trees will supply a considerable portion of the trees required for the proposed enlargement of existing clumps, and by keeping up a constant succession of nursery planting, the required trees for forestry purposes can be always at hand in the best possible condition for transplanting.

The Arboretum.

In attempting to extend the arboretum the Committee found that it was absolutely necessary to rearrange the front grounds, and to provide some definite and well arranged plan that harmonized with the grounds and buildings on which to base all future work. Hitherto no such plan had been prepared, hence it was impossible to proceed systematically with the extension of the arboretum in a manner that would subserve the purposes of education, and at the same time adorn the grounds and produce the proper landscape effect. After some correspondence we were so fortunate as to secure the services of the most eminent landscape gardener in America, Mr. Chas. B. Miller, of Fairmount Park, Philadelphia. He visited the College in April last and examined the grounds thoroughly in company with yourself, the Committee and the architect. He has now propared and placed in our hands a most admirable plan of all of that part of the grounds; this plan has been approved by yourself, and when the planting and grading shall have been completed in accordance therewith, we believe that the College grounds around and in front of the buildings will be all that can be desired. Work has been already begun and the grounds immediately in front of the main building laid out in conformity with the plan, and the requisite carriage-ways to the recently erected residences of the Professor of Agriculture and of the Bursar provided. Already a great improvement in the appearance of the grounds is manifest, a pleasing foreshadowing of the results to be achieved when the whole work is once completed, and time enough shall have elapsed to produce the growth necessary to give the effect to the whole. Ample space is now set apart for the planting of an extensive arboretum, which your Committee intend shall be grouped in such a manner as to be convenient for study by the young men, and serve as illustrations in teaching, and at the same time these groups will be so placed as to give the best landscape effect. The new buildings, including those which have been erected this summer, and those which are contemplated in the future, have been located upon the plan with a view to the general effect of the whole when they are completed. The buildings yet to be erected, and which are already very much needed, are the conservatory and propagating houses, with lecture-room attached, a chemical laboratory for teaching analyses of soils, manures, etc., and the head gardener's residence. It is to be sincerely hoped that the Legislature will grant at its coming session the funds that may be needed to erect these buildings, the lack of which greatly cripples the effectual working of the chemical and horticultural departments.

The Seed Beds.

With a view to giving a supply of young trees for future planting, and to afford at the same time instruction in the raising of forest trees from seed, a number of beds were prepared and sown with tree seeds. As was to be expected, some of these seeds failed to germinate the first season, and after lying dormant in the ground for a whole year, came up in the second spring. From these beds a goodly number of some varieties of trees and shrubs will be obtained. Some of the kinds sown have apparently failed altogether, thus affording lessons to the student from failure as well as success.

Future Operations.

We have made arrangements with the Professor of Agriculture for a half acre block in the experimental field, which it is our intention to surround with a hedge formed of a variety of hedge plants, for the purpose of showing a sample of hedge formed from each. This will afford both students and visitors an opportunity of seeing the results produced by each plant when trimmed close and grown as a hedge, and test the adaptability of each for hedging purposes. The enclosed plot will be devoted to nursery beds for the growing of young trees taken from the seed beds or procured by purchase, until they have attained sufficient size to be removed to permanent situations. It is also intended to set out in the spring two or three aditional clumps of forest trees, one of White Ash, one of American Elm, one of mixed evergreens, also to complete the group of European Larch, and extend that of Sugar Maple.

In the orchard all vacancies will be filled up, and the acre of ground recently purchased planted out so as to complete that portion; and such other varieties added as may be desirable for the purpose of testing their adaptation to our climate. Some additions will also be made to the plantation of gooseberries, currants, raspberries and strawberries in order to furnish a sufficient supply, of these fruits for the use of the College, a large part of which will be taken from the existing plantations, particularly of raspberry and strawberry. Some new varieties of these fruits, and of grapes, will also be set out in the spring, together with a few mulberries, so that the work of testing these may keep pace with the progress of horticulture elsewhere.

In conclusion your Committee would say that such progress has been made in the departments of fruit culture and forestry during the short time that has elapsed since you confided these to our direction as we trust will be satisfactory to you, both in the amount of work done, and in the economical manner in which it has been accomplished. In a work of this kind great results cannot be achieved in a single season, yet, even now some fruit is being gathered, some improvements, we think, are to be seen, and these, we believe, will increase in progressive ratio as the years roll by, until the results shall be seen in an abundant supply of fruits of all kinds suited to the climate, sufficient to meet all the wants of the College, both for consumption and comparison; and groves of trees, and groups of specimens of every variety of tree and shrub shall give beauty to the landscape, and afford means of instruction in all that a well-informed yeoman can wish to know of the character and uses of the forest products of his native land.

In behalf of the Committee,

D. W. Beadle,

Secretary.

PART VI.

REPORT

OF THE

PROFESSOR OF AGRICULTURE,

FARM MANAGER AND EXPERIMENTAL SUPERINTENDENT.

ONTARIO AGRICULTURAL COLLEGE AND EXPERIMENTAL FARM,
GUELPH, 31st December, 1882.

To the Honourable S. C. Wood,
Commissioner of Agriculture :

SIR,—On entering the eighth year of my work here, I feel it is due to the institution and all its connections, to submit a critical review of the farm cropping, from a conjoint practical and scientific standpoint. A good deal of this kind of reporting has been done by me with reference to live stock in recent communications, and while, in the view of many, cattle and sheep now-a-days are leading the agricultural world, it would be very unwise to overlook what, in our provincial conditions, is still an absolute essential to live stock success.

I ask for a scientific association in this matter for two good reasons: First, because our profession here is to teach it, and, second, that all advanced farming is willing to take lessons from any reasonable and non-technical presentation of the question.

Allow me to term this chapter the science of our agricultural practice, not the practice that is supposed to have been taught by science, for no one could possibly become a farmer in practice by applying any amount of scientific knowledge. It is as true in ours as in other professions, that scientific men learn from practical farmers the very sciences which they themselves practice—in no other way could science be applied to farm practice, I think.

I am prepared to receive the query that may be put—and would be reasonable from many men—is it possible that one individual is able to so blend his practice with science, that others may safely take a lesson? In answer to this, I take great pleasure in assuring our European and American friends, that not only are very many Ontario farmers well read in scientific matters relating to their business, but regularly and systematically carry out a course of cropping based upon light thus obtained, procured also by practical test through their own repeated experiments. This statement is possibly new to even some of our leaders of thought in rural economy, as indeed it may be to some of the very actors themselves. As a twelve years settler of this country, with previous experience akin to what Ontario has given me, I make the assertion, free of all influence, that the average intelligence of our farmers is equal to the same thing in Britain ; they are intellectually brighter—in very many cases too bright—they read more ; they have been obliged to think more, and act independently, so thus they now stand upon a higher agricultural platform than their professional brothers in England, Ireland, and Scotland, according to the *physical influences* of the respective countries. I could name hundreds of farmers in Ontario who, had they practice in the power of expressing themselves as required when the story of science in farm practice requires telling, would astonish even a Liebeg and a Lawes.

Our farm of 550 acres has now 400 under cultivation. Since 1876 the mode of cultivation has been a seven shift, based upon getting up dirty and comparatively impoverished land, but yet land of good texture, and of all characters from clay loam down to gravel. Every root division, systematically every year, received a very large amount of farm-yard manure and special fertilizers, so that the whole farm has been gone over in this manner. During that period the average annual produce per acre was 30 bushels peas, 32 bushels barley, 18 bushels spring wheat, 35 bushels fall wheat, 45 bushels oats, 800 bushels mangolds, 650 bushels turnips, 600 bushels carrots, 180 bushels potatoes, and one and four fifths ton of hay, with an average of one and three-fourths ton of straw of all sorts.

Now what is implied in this mean annual produce of 13,580 lbs. per acre from a complete circle of crops under such conditions as have been named? Am I prepared to show all the scientific and practical bearings of such an issue through all the stages of seasons, cultivation, fertilizing, and grazing? I do not hesitate in answering, I am not, nor possibly could any other man have done so.

Well, in this case, wherein lies the exact lesson to the student and the country? No doubt we have yearly sketched the management of each field, and tried to account for results in the usual common-place way, but more is incumbent at the end of the first complete rotation.

How much of the soil of every field was active, and how much dormant at the beginning, and at the end of the period? No chemical analysis at any stage would have helped either the farmer or the scientist to check the *available* amount of plant food, because no chemical knowledge can distinguish between active and dormant matter.

Were the modes of cultivation and fertilizing the right kind to develop any inactivity or deadness, and did we know each year just how much to do in accordance with this physical condition of soils, so as to economise both labour and additional food supply? I doubt it very much.

Particularly, by what were we guided then in applying per acre fifteen loads of farm yard manure, one hundred and fifty pounds of mineral superphosphate, one hundred and fifty of gypsum, two hundred of bone dust, and three hundred and fifty pounds of salt? The argument has been that, not knowing what might be needed for the six succeeding crops after the root one—with which these fertilizers were always introduced to the course—it was best to provide plenty in view of all demands. Can this be called enlightened scientific practice in these days? Very doubtful, indeed.

What has become of the thirty tons of mineral superphosphate, thirty tons gypsum, forty tons bone dust, eighty tons salt, and six thousand tons of farm-yard manure, that cost us, one way and another, the handsome sum of $17,550? Practically, we know not. Evaporation, washing away, producing crops, and what yet remains, would likely square the account, but how much to the credit or debit of each will never be known.

Thus, in starting the enquiry into our farm practice since 1876, we are met with the two great problems, the unknown physical condition and action of soils, and the known character, but unknown positive effects of climate.

The Science of our Agricultural practice—where is it? Are we doing more than the good average farmer after all? Understand, we are speaking of more than ordinary practical experience, and more than pure practice in crop-growing, in which, of itself, we think, our lessons are good; but wherein are we capable of tracing all the scientific relations of such practice as already indicated?

I have taken many young men over our fields every year, in practical illustration of the lecture room statements, but how much could I say positively in regard to the existing co-partnerships of our allied sciences with the agency under foot—called soil? Have manures been assistants, or substitutes; or among themselves, have they been or are they now competitors as food for crops; how much injurious matter has been dissipated by the action of drainage, certain fertilizers, and cultivation, and to what extent did chemical condition indicate productive powers—active and dormant? These, and others, have been to me, as they are still to many men, dark things, waiting, it may be, a more able and subtle exponent than The Ontario Experimental Farm.

I think the best way to illustrate my subject is to take up some of the crops of 1882, and through them, upon the respective fields, expound as may be required; first then in regard to

FORTY-THREE BUSHELS OF FALL WHEAT PER ACRE.

This means fully twice the average of our Province during the last ten years. The soil is a good clay loam, neither light nor heavy, with a distinct northern and southern exposure—indeed a high-lying, irregular field, without any shelter whatever, except on the south-east. The new reader has to be told that the average field of our farm is situated no less than 850 feet above Lake Ontario, and, therefore, 1,100 feet above sea level.

The adaptability of clay loam to grow wheat is unquestioned; its real or assumed amount of alumina, its consequent firmness, with sufficient mellowing property, the power of retaining moisture, and the whole stamina of it is indicated by the full head and plump, bright sample of grain of a suitable kind, such as the Soule, the Diehl, and, in this example, the Clawson or Seneca variety.

Now, it is perfectly evident that these forty-three bushels per acre were affected by the following :—

1. Weather—winter and summer.
2. Soil.
3. Previous manuring.
4. Cultivation, as applied to tillage.
5. Rotation of previous cropping.

These stand in the order of their influence—from greatest to least—according to our experience, and partly, no doubt, to individual judgment. In criticizing this placing of Ontario cropping regulators, it must be remembered that in addition to our extensive experience, our appliances, methods of observation, and much of our line of work, has been special in that direction. If anybody says, for example, that in their experience an appropriate, and judiciously applied—*i.e.* not an unbending—system of rotation of crops, has been of greater influence than cultivation, in the average production, we would have to ascertain just exactly the whole going and coming of their cultivation; because many farmers are miserable workers or tillers of the soil, and yet obtain wonderful crops—they place more on rotation than on cultivation—all the while that good produce was got through good soil with farm-yard manure. We cannot undervalue rotation, especially in the older townships, but, in all our knowing, it is second to proper cultivation.

Were doubt admissable as to order of precedence in this cropping influence, it might be spoken of as between manuring and cultivation. There, no doubt, the particular soil would turn a finely balanced valuation on the one hand, and an appropriate manure to that soil and the particular crop on the other. So, altogether, while adheirng to the foregoing list, a liberal allowance must be made for specialities.

If possible, to help us still further in tracing the source of these forty-three bushels of wheat, it is necessary to submit the previous cropping, cultivation, and manures applied.

CROPPING THAT PRECEDED FORTY-THREE BUSHELS PER ACRE OF FALL WHEAT.

1876.	1877.	1878.	1879.	1880.	1881.	1882.
Hay, 1⅙ Ton.	Pasture Poor.	Pasture Poor.	Peas, 27 Bushels.	Oats and Barley, 20 Bushels.	Bare Summer Fallow. Manured.	Fall Wheat. 43 Bushels.

The crop production of this field (No. 5) from 1876 to 1880 inclusive, exhibits a very clear case of under average; the hay of 1876 was only one and one-sixth ton per acre, and the pasture of 1877 and 1878 was of a poor description—few plants, no tillering, and no vigour of any kind. On the breaking up of the sod, and a crop of peas taken in 1879, something good was anticipated because the season was propitious, seed good, and free of disease, but still there was no crop to speak about, only twenty-seven bushels per acre from two varieties. Oats and barley, in equal divisions, followed in 1880, not wheat, as would have resulted by the rotation used as a guide, because it was evident something was wrong. This also was practically a failure—not even half a crop. An examination of the field at this stage showed nothing to the eye as needed by drainage or manuring; we had been building upon a pretty thorough management of the root course in 1874—and the taking of but two crops of hay—1875 and 1876—though by-the-bye the field lies a long distance from the manure pile—a suspicious cause of poverty on many farms.

Had we followed our rotation guide, the crop of 1881 should have been roots, and would have been so but for the fact of many weeds, principally thistles, and that much of our previous experience had failed to thoroughly eradicate them by root management. Thus, bare summer fallowing was decided upon in 1881. It has been proved again and again, that bare fallowing is not always, as imagined by many, a means of enriching soils, as well as cleaning them; we have the most clear evidence, from extended and reliable experiments, that under the majority of conditions, such a form of repeated exposures of the soil to the atmosphere tends to depletion in place of enriching. But, as already said, it is not always the case. Where land has been indifferently cultivated, where possibly richness had been accumulating both from natural and artificial means, and where consequently *inactivity* had been induced by such conservation of energy, the five years' practical deadness can be accounted for.

In proof of this position, we think it is plain that the fallowing of field 5 in 1881, in addition to the farm-yard manure applied, that is repeated ploughings from May to September, so exposed, deepened and made dormant materials active, as that it was fitted to produce any crop in greater abundance than previously it could possibly have done by any other mode of treatment. Unquestionably the farm-yard manure did not act so much as an immediate stimulant as is generally supposed—one-half at least of the value of this form of manure lies in its physical action upon the soil, thus assisting the fallowing process and adding to future fertility.

The winter of 1881-82 was not particularly good, not even good for average wheat life, and summer weather, while propitious, was nothing remarkable for growth and maturing.

Sixty Bushels of Oats per Acre.

This is one-half more than our usual produce. The preceding case of forty-three bushels of wheat illustrated the want of thorough tillage on an old field—this is evidence of the value of comparatively new land from a completely waste swamp (field 15), drained and stumped between 1877 and 1879, and finally cleared up in 1881.

The cropping has been:

1877.	1878.	1879.	1880.	1881.	1882.
Swamp.	Corn and Rape. Thirty Tons.	Oats. 25 Bushels.	Oats. 28 Bushels.	Mangolds. 1,006 Bushels.	Oats, (Seeded) 60 Bushels.

Soil a deep, open, friable clay loam, with patches of a thin vegetable surface, and three acres of a dishy and more mucky swamp, having a subsoil of clay loam upon a bed of shell marl. After drainage and part stumping, the first crop was corn and rape, broadcast, for fodder, with the view to break up and bring under an evident superabundance of good things. Result—an immense bulk of *stalk* without corresponding leaf. Good thus far; and in 1879, in order to further subjugation, oats were sown; yet, again, such a rank growth of straw, without grain in proportion, only twenty-eight bushels per acre, that we determined to test the maxim laid down by one of the early agricultural fathers, that land that has given a good crop will give another good one of the same kind in succession, so, in 1880, oats were repeated. The weather was fairly favourable, as in 1879. We were disappointed but not surprised—experimental work must needs *bear* a great deal. By this time drainage was telling, gross vegetable matter undergoing changes, and general clearing of tree rubbish being overtaken, but still no crop to mark progress. Summer fallowing was not needed to eradicate weeds, and mellowness prevailed all over. Maybe some of our friends will interpolate, why did you not send the students to the field with phial and acid to test for noxious matter, or for anything that might be wanting?—theoretically good—sometimes practically advantageous, we reply, and in this it was not neglected by myself, but practical experience is better than most scientific help.

The land was simply too strong in fertility, and wanted lime and salt to check and correct. I am of opinion, that had we applied per acre 100 bushels of lime and four hundred pounds salt, along with a thorough use of the plough and harrow for another crop of oats, the result would have been superior to what was undertaken. But, being desirous of adhering as closely as possible to our rotation guide, a fallowing with roots, mangolds chiefly, came in 1881. These, as usual, received farm-yard manure and special fertilizers. It is a question at this point, whether fuel was not added to the flames by such treatment, more fertility to what we think had already an overabundance of it? Of course, the salt by itself, and lime from mineral superphosphate, gypsum and bone dust, were intended to act, and these no doubt did act, more as *medicinal agents* than direct food supply; but farm-yard manure must have stood partly as a direct feeder, as well as an opener up and tiller of the soil.

A clear knowledge, could it have been got here, of the exact line of association of science with practice, would have revealed a most interesting and highly valuable field of agricultural study.

Natural wealth, added fertility, medicinal fertility, and thorough cultivation gave us, in opposition to a highly adverse season, one thousand and six bushels of mangolds per acre.

Then followed, the subject proper of these notes, sixty bushels oats per acre. The Black Tartarian variety, one year in Ontario from Scotland; strong straw of good quality, but much rusted by a moist, hot season. Still, too much stalk and not enough grain, for although sixty bushels is a big crop, had head corresponded with straw we would have had eighty bushels per acre.

Two Hundred and Five Bushels Potatoes per Acre.

We have not been very eminent as potato growers, because, I think we have paid more attention to roots proper, and partly because previous management looked upon potatoes as requiring, and perhaps deserving, less attention.

Field 2 is broken by a ridge of gravel, having on both sides a flat of warm, free loam, that has regularly come through the prescribed rotation. As we always treat potatoes as part of the root division, they got here the usual amount and variety of manures immediately before drilling, or rather ploughing, and planting every third furrow. The Early and Late Rose varieties have all along led in size, quality, prolificness, and reliability under disease. We have never been able to place the potato as a fallowing crop so well as turnips and mangolds, because the character of growth is such as prevents the free use of the hand-hoe; so also as a feeder from below to the overlying tubers it takes a distinct position, in mellowing and enriching the surface.

Over two hundred bushels per acre—six tons—is a fine crop, which in science and practice anywhere, implies much that we are ignorant of in soil or atmospheric sources of starch, sugar, potash and sulphuric acid. In practice we see and can estimate the different action of potatoes to turnips, but what can we tell of the different condition of the soil after the removal of the respective crops.

Twenty-five Tons Corn Fodder per Acre.

The average crop of this fodder, green, in field, was twenty-five tons per acre, the highest thirty-five. I am not well up in the growth and management of this cereal for grain, simple as it is to many, but have handled it extensively as a fodder plant. Its position for grain in a rotation—when cultivation plays a prominent part in its management—has never been well defined, that is, having a place on sound scientific and practical grounds in accordance with previous and succeeding crops. Cereals, as a rule, are not cultivated, and thus corn is sometimes used for fallowing, at other times for breaking up sod in preparation for other crops. Indeed, it can well take the place of both, thus:

Corn or Roots,
Wheat,
Hay,
Hay.
Pasture,
Pasture.

But, there are just two important questions to Ontario farmers in the cultivation of this fodder, its effect upon land, and its preservation for winter use. Much of the cause of no increase in production has been the fifty per cent. of waste by having to shock and leave in the field during winter, until consumed, and the not knowing how to preserve under cover. I believe a complete revolution is afoot in this regard There is nothing more common-sense and natural than that our corn fodder should be daily accessible in the immediate neighbourhood of our cattle as much as other fodders and green things during winter. The wonder is that some plan was not earlier thought of, and, after waiting so long, that it is so simple and efficient as in an ordinary cellar—ensilaging in a silo as it is called. I have every hopes of seeing this system in extensive use in our present cellars within a few years—not of *necessity* in new built silos. We have now thirty tons in an old cellar specially arranged to test as an inexpensive method for the average farmer, believing this to be more our line of work than building a special pit or silo at $500 or $1,000.

Granting the success of ensilaging, to what extent will the country be justified in growing a larger area of the corn fodder in connection with mixed farming, and where best would it come in the rotation, for of right, if not of necessity, it would demand an annual position in sound agreement with science and practice? Why not in association with peas, thus?

Peas and Corn,
Wheat,
Roots,
Wheat (seeded),
Hay,
Hay,
Pasture,
Pasture.

Suitable for the corn plant after grass and clover, helping the pea to break sod for wheat, and not too "hard" after four years hay and pasture.

Eleven Hundred Bushels Mangolds per Acre.

With long reds and yellow globes, over six acres, we had one thousand one hundred bushels, or thirty-three tons per acre, in field 2. Just twenty-nine tons water per acre some may say. It is just possible that corn fodder may supersede turnips and mangolds to some extent, and as they are about equal weights per acre, on an average, it is a question of feeding value per acre.

FROM TWENTY TONS PER ACRE WE HAVE

	Corn Fodder.	Half Mangolds, and Turnips.
Albuminoids	1,000 lbs.	640 lbs.
Crude Fibre	2,680 "	380 "
Carbohydrates	4,680 "	2,880 "
Fat	280 "	40 "
	8,640 lbs.	3,940 lbs.

This cannot but astonish some root growers, and may convert not a few, though we trust the conversion will be properly disciplined. Volume of materials, as in the above example, does not necessarily imply more beef or milk, because the *form* in which food is presented, even in the natural state, is a heavy element in nutrition. It is quite obvious, however, as previously remarked, that when able to economically and successfully preserve corn fodder, the turnip and mangold area is sure to diminish in Ontario proportionately to advancement and to number of live stock.

SEVEN HUNDRED BUSHELS SUGAR BEETS PER ACRE.

We have grown these experimentally every year since 1876, and this year to a considerable extent for experimental feeding of Cattle, against carrots, turnips and mangolds. The varieties are :—

1. White Grey Top.
2. White Green Top (Brabant.)
3. Electoral.
4. White Green Top.
5. Early Rose.
6. White Red Top.
7. White improved (Vilmoring's)
8. White Sugar.
9. Imperial.
10. White Small Rooted.

Our turnip and mangold growers do not like the fingery character of some of the sugar beet, making harvesting and cleaning so difficult, though pleased with their better keeping properties. They contain less water and very much more carbohydrates (starch, sugar, &c.) than turnips and mangolds, and may be called an expensive green fodder when it is a fact, it is said, that even their pulp, after going through the sugar mill, is a high feeding material.

EIGHT HUNDRED BUSHELS CAROTS PER ACRE.

This is still a greater proportion of starch and sugar, more Albuminoids and more fat than any of the other roots proper ; why then are so few of them cultivated ?

The White Belgian, with us, is unequalled in vigour and weight per acre. Our acre this year was in No. 2 field, a low lying, dry, deep loam, well cultivated and manured. Plants were left rather close—four inches—as we did not anticipate more than ordinary produce. Very many of the roots, however, measured over twelve inches in circumference at top, and so a common sight was a fight for side space, some being actually pressed out of line.

Eight hundred bushels (twenty-four tons) per acre of roots that go an average depth of nine inches, stand for a kind of cultivation that is neither common nor liked by many, and both thinning and harvesting are comparatively expensive, but, the present ordinary market would give us $120 per acre, as against $65 and $80 for turnips and mangolds, respectively.

Hay and Pasture from varieties of Grasses and Clovers.

There is nothing in all agricultural practice anywhere that gives such an idea of wealth under comfortable conditions, as a rich meadow occupied by cattle or sheep. Rest, and growth of flesh, milk and wool, with a conserving for future crops, that pasture alone can best provide. Any amount of practice, lecturing and teaching, will never make any people first-class, independent farmers, until they know well how to secure and maintain permanent pasture.

But the average rotation pasture is not what animals demand. Canada, as yet, practically, makes hay and the pasture follows as best it may; hay is not made subservient to pasture: reflect one moment on this inconsistency. In order to obtain one and one-half ton of fodder per acre, per season, twice, for winter use, valued at $30; we grow one grass and one clover together, a great part of the latter disappearing the second year, and altogether the third year; the single grass is therefore the only pasture for the third and fourth years, when it is again broken up by rotation. On the other hand, when the proper kinds of grasses and clovers, in variety, are sown, as detailed in last year's report, there is an annual offering, reliability, and value almost incomparable. But compare them thus:—

Value of Hay and poor Pasture *versus* Value of Hay and Good Pasture.

PER ACRE.	Hay and Poor Pasture.	Hay and Good Pasture.
	$ cts.	$ cts.
First Year, 1½ tons hay	15 00	15 00
Pasture, one year	1 50	2 50
Second Year, 2 tons hay	20 00	20 00
Pasture, two months	2 50	3 50
Third Year, Pasture	6 00	12 50
Fourth Year, Pasture	5 00	12 50
Total	$ 50 00	$ 66 00

Not allowing for superior manurial condition of the proper mixture of grasses and clovers. In the one case, we obtain $35 of hay, and only $15 of pasture; in the other, about equal values of both hay and pasture, and this is what it ought to be, equal values per acre per annum, no matter what the crop is.

Such, in variety, and importance, all over our farm of twenty-one fields, of twenty acres each, is now the position of science and practice. There is not a poor subject, except No. 21; all are flushed with an abundance of good things.

CROPPING ABSTRACT, 1882.

Field.	Area.	Extent of Cut Crop.	NATURE OF CROP.	Quantity. T. Tons. B. Bushels.	Total Quantities.
1	20½	10	Pasture	....	....
		10	Corn Fodder	25 T.	250 T.
		2½	Tares and Oats	2 T.	5 T.
2	19	7	Mangolds	1,000 B.	7,000 B.
		2	Turnips	600	1,200 B.
		2	Sugar Beet	500	1,000 B.
		7	Potatoes	205 B.	1,435
		1	Carrots	800 B.	800 B.
3	22	22	Pasture	....	....
4	9	9	Fall Wheat	43	387
5	13½	13½	Fall Wheat	43	580
6	25	13	Hay	1¼ T.	18 T.
		12	Barley	30 B.	360 B.
7	20¼	20¼	Hay	1½ T.	30 T.
8	22¼	22¼	Spring Wheat	23 B.	511 B.
9	21¼	21½	Hay	1½ T.	30 T.
10	19	10	Oats	40 B.	400 B.
		3	Experimental Wheat	....	....
11	21¼	21¼	Peas	35 B.	735
12	18½		Uncultivated	....	....
13	23	23	Pasture	....	....
14	23		Summer Fallow	....	....
15	21½	21½	Oats	60 B.	1,200 B.
16	22¼		Summer Fallow	....	....
17	20	10	Hungarian Grass	1¼ T.	12 T.
		10	Millet	1¼ T.	12 T.
18	19	13	Fall Wheat	30 B.	390 B.
19	30	16	Oats	40 B.	640 B.
		14	Turnips	800 B.	11,200 B.
20	11		Uncultivated	....	....
21	16½	16½	Pasture	....	....
	417¾	331	Under Crop 1882	....	....
	132¼	45¼	Under Summer Fallow	....	....
		29½	Uncultivated	....	....
		144¼	Other Lands	....	....
	550	550			

III.—THE LIVE STOCK.

THE GENERAL CONDUCT OF OUR CATTLE.

As an accompaniment to what has been said about the farm cropping, I propose to sketch our seven years' experience with six breeds of cattle, and five of sheep. This should mean a great deal ; management, food, and condition of climate having affected all alike, our comparative notes for such a lengthened period cannot fail to interest.

The Canadian.—I know of no class of cattle so well deserving a first notice in these pages as the Canadian. There is a distinct type entitled to this name. I do not mean those with a touch of Ayrshire, Devon, or any others—not even the shorthorn grade, but that moderate sized, milking, wiry, active stamp, well known to the average farmer. If this be considered as somewhat indefinite we shall be glad to point to specimens here or elsewhere. I claim that the Canadian deserves more notice than has ever been given to it—public and specific—giving a recognized position that cannot be doubted. Have we on record anywhere, such a description and history of the Canadian cow as that ; when the time comes, as come it will, when the Herd Book Editor will require materials with which to trace back to the beginnings of what, with him, may be as eminent as any Bates or Booth in England? This is no improbable matter indeed, but deserves our serious attention.

Our experience of this breed has been intimate and very satisfactory. We hold, by clear and substantial evidence, that the Canadian cow takes no mean place as a milker, a mother, and a field for wide work, both for beef and dairy purposes. Much is due to her distinct character in some respects: she is decidedly content with her average circumstances—miserable as they be at times; can do as well in the bush as on clover fields, and responds with her best when the thermometer is at zero, or 90° in the shade. Her quantity of milk is not so large as the Ayrshire for six weeks after calving, but far ahead in continuance, and therefore, on an average, equal; in cream it is unquestionably superior to the Ayrshire. No one well acquainted with the breeds would choose the Ayrshire against the Canadian, where hardiness and profits under ordinary conditions were elements.

So also in regard to a common source for cheap production of beef with a Shorthorn or Hereford bull—other bulls have not, as yet, been sufficiently tried, except the Ayrshire and Devon, which cannot compare with these two. While small as a beefer, the Canadian cow is roomy as a breeder, and thus affords field enough for such a purpose..

I am confident that a proper selection of the milking Canadian would add immensely to the dairy and beefing interests of the country.

The Devon.—The remarkable feature of the Devon with us has been an uniform conduct, no coming and going in anything, but an even run of breeding, health and good doing, under all conditions. Summer and Winter the Devon is equally at home; plump on pasture, and in good heart in the stall without grain. They have been also particularly good mothers, nursing their calves in a manner superior to anything in our experience. The Devon calf is always a full calf on its own milk alone, rolling in fat and with all the build of an old animal. The particular character of the breed, and rich milk give these results. After weaning, and all up to heiferhood breeding, there is a distinct heartiness and vigour—on the small scale as regards size; there is no stunting according to their kind, but one has to know the kind in order to appreciate the difference between them and the larger beefers. We have never got much milk from a Devon, but in quality it is second only to the Jersey. The bull attains to a greater size and weight, proportionately to the cow, than the same thing in most other breeds, as his "get-up" is comparatively more of a beefer than, for example, the Ayrshire bull is against the Ayrshire cow. The Devon cow, therefore, is a milker in quality and moderate quantity, while the bull gives a frame to the steer that compares well with others for beef carrying. But the steer will not mature so early as the Shorthorn, Aberdeen poll, and Hereford, nor ever attain the same weight on an average.

The Ayrshire.—We have had a pretty thorough test of the Ayrshire cattle. In sure breeding we have no cause to complain, nor can anything be said against their adaptabiliy in raising a calf. Every cow we have has had to be milked three and four weeks previous to calving—an imperative necessity to avoid milk-fever. After calving, two of our best have regularly suckled two calves, and, in addition, have had to be milked with the hand twice daily for two and three weeks—depending upon the time of the year—whether on grass or in stall. We have not, however, been treated to that continuance of milk that I was intimate with in the Lothians of Scotland—the great flow lessening more rapidly and dribbling too long. I do not attribute this to actual poorer pasture or keep otherwise, but to the great difference in climatic conditions and to the want of that important variety of grasses secured only in permanent pasture. It is not true, in our experience, that the Ayrshire cow gives a lash of milk on comparatively bare pasture—in which regard she is, on an average, decidedly inferior to the Canadian—but it is true that her milk is of that blue type, not so rich in cream as characterizes them in their own country. A cross between the Ayrshire bull and Canadian cow is in good repute as a milker with us; they do not lose in size of frame, and gain somewhat in long milking. A cross with an Ayrshire cow and Shorthorn bull has not shown any advantage in milking, and very little in build for beefing, though the steer is vigorous and growthy, but too slab-sided and wedgy—taking too much after the mother. Practically, then, as regards the pure Ayrshire, they require good treatment in order to maintain their famous milking properties, and I am of opinion that an infusion of new blood is as often needed as in any other breed—not so much a change of bull from other herds in this country as that of a directly imported one.

The Hereford—This breed has exhibited a very clear and steady line of conduct all throughout. No trouble in breeding, and no petting required. The Hereford is a good mother—second only to the Devon, in our experience, and ahead of its dangerous compeers, the Shorthorn and Aberdeen poll.

We have been charged with partiality and lack of practical experience in cattle life by our American critics, especially in comparing Herefords and Shorthorns. This is not true, and I trust will never be so. As responsible to a liberal Government, and guiding a grand country it is, above all things, our religious duty to report just how it is in every case—no colouring, no exaggeration, and no understatement of anything whatsoever. To say more is unnecessary, to say less would savour of want of interest.

The Hereford, I repeat, has shown an uniformity of conduct, quite exceptional along with the Devon, without grain winter and summer—bran excepted, and the usual treat after calving. The Hereford keeps fat on pasture and in the stable, never falling off, even when suckling. Greedy enough, no doubt — down to the horse manure—not a specialty as showing a want of something, but a consistent looking out for number one. We have no breed, as a whole nor individuals among breeds, that can touch the Hereford in maintaining flesh on pasture. Indeed, we have cases of too much tendency to covering the ribs, and taking from the calf; and a peculiarity of their build is the being deep in calf and not showing it, as is otherwise in most other breeds—the calf also coming without affecting the mother's appearance much.

The fattening steer from the Hereford bull and Canadian cow is quite characteristic; the marking is strong and unquestionable; the build is a Hereford in almost every detail —the pig ham (as age advances), the round compact barrel, longish rumps, deep twist, and the general low chunky set of the whole animal.

The Shorthorn.—We have never treated one breed of cattle or sheep differently, unless special circumstances demanded; thus, then, these comparative notes are the more valuable and reliable. I say this here because Shorthorn history with us has been more complicated than with other cattle—not, certainly, by reason of want of variety in blood and family, nor even numbers to make a good average, for we have, or have had, plenty of both. With Shorthorn leanings, as an individual, I can freely and fearlessly, nevertheless, record how Shorthorns have conducted themselves with us for seven years.

We can speak highly of the milking properties—in quality and quantity—of the most of our cows of this breed, making good calves or reliable milkers, as the case may have been. We have nothing to say against the sure breeding of the cows, but our four bulls, in these years, have not given satisfaction in this respect. Without exception, they have caused delay, loss, trouble, and extra expense. Why, I am not prepared to say. Two were imported, and two Canadian bred; none were ever in such high flesh as those of some other herds, indeed, we have noted very distinctly that those bulls in best flesh—that is on the heavy side—have been surer in getting than those on the less fleshy side. But—and I desire most seriously to make this "*but*" once and for all understood—we have never fed Shorthorns differently from others; if we had done so, this would be no *experimental* station. Understand what I mean by this. If we have a two-year-old Shorthorn bull with a large frame weighing 1,600 pounds, and a Hereford exactly of the same age and of a smaller frame weighing 1,500 pounds; we feed them according to weight or size, a little more to that weighing the most; this is in agreement with all rules of common sense as well as science and physiology—not breed, because we do the same thing with individuals of the like breeds, *but* we have never fed the Shorthorn because he was a Shorthorn, nor the Hereford or Aberdeen bull because of their kind. This is the true experimental idea, we think. If, it is said, the choice of individual bulls was bad, then the reply is that three independent judges did so; if management by want of practical knowledge is charged, then the same management had ado with the other bulls that have stood so well. If the Shorthorn require on an average more drawing-room attention than other beefing breeds, then it had better be acknowledged at once, and I do not think their admirers need be ashamed of the fact.

We have fattened Shorthorn grades, Hereford grades, Devon grades, Ayrshire grades, and Galloway grades, both in the stall and on pasture, and nothing equals the Shorthorn in giving that stamp to produce weight in the shortest time on *Ontario conditions*—growth of youth on good pasture, and finishing in the stall.

The Aberdeen Poll.—We hold the honour of having introduced this breed to Canada, as put by Mr. McDonald, the clever author of "Food from the Far West," as well as the recent work on Aberdeen polls, who is also editor of the "Irish Farmers' Gazette."

Our experience thus far is somewhat irregular. Health and breeding have been very good, milking sure in moderate quantity and rich, with plenty of flesh both in stall and pasture, yet we have to record an indefinite sort of instability difficult to explain—I speak now of the first imported animals and their progeny, not of 1881 purchases. The instability in question has reference to a coming and going of health, especially in summer, as indicated by change of coat and a general "staring" of the whole animal, as if going through a course of medicine. Individual animals of any class often do so, as everybody knows, but not a whole herd of one kind. There has been no sickness, actually.

We have on hand some very fine steers—the first cross of an Aberdeen poll bull with Shorthorn grade cows, with which we trust to convince the Province ere long as to the eminent beefing properties of the Black Diamonds of the North of Scotland.

2.—General Conduct of Sheep.

As it is not the breeder of pure breeds of sheep who rule the flesh market, any more than in the case of cattle, the common sheep of the country are entitled to a distinct place in our agricultural history.

The Canadian Ewe.—What is she? A very difficult question to answer. If roadside samples be taken as a guide she is everything and nothing, most clearly. The reference to the road-side bids me say that of all kinds of pasture in Ontario—I cannot speak of other Provinces—whether rotation, permanent, bush, or cleared wild pasture, upon farms, none equals much of what covers one-half of the width of our highways; it is a close mat of the better native grasses with white clover, offering at all times a rich sweet bite for sheep, and is top-dressed every heavy rain by the washings from the traffic-manured centre. As each township on an average possesses about 250 miles of opened roads, of which one-half of the area is under such pasture, there are actually one thousand acres of an excellent sheep run able to maintain at least one thousand head annually. This is no fancy, and I do not care though some sceptic belie it—say 500 head, therefore. There being 300 townships in older Ontario, we have the magnificent figure of 150,000 sheep that could, at the lowest estimate, be maintained at no risk or annoyance to anybody on our highway pasture. By the August statistics of our Bureau of Industries there are 2,000,000 sheep of all ages and kinds in Ontario—say 1,500,000 for the older parts referred to, which shows that over one-tenth of their number either are or should be kept upon the road—allowance being made for thoroughbreds that are not allowed such liberty. The annual value of this "commonty" cannot be put at less than $300,000.

The Canadian ewe, on an average of localities as influenced by great centres of long and short-wool pure breds, is a mixture of Leicester, Cotswold, Lincoln, and Southdown in all degrees of variety, but generally with a predominating Leicester type. She is roomy according to size, fairly well woolled, weak forequarters, ewe necked, and combines hardiness with ability to raise a good lamb and give above an average quality of mutton.

The Leicester.—After the Canadian, which traces so much to Leicester, the same Leicester deserves our next notice. Our experience has been nearly altogether with the border type, and not the English proper, which, it is now well agreed, differ only as affected by conditions of upbringing—not in blood or original source. We have nothing in sheep life that can touch the Leicester in being early ready for any purpose, on getting what it likes. Breeding has not been so sure or prolific, about one lamb per head; they are but moderately good nurses, being too selfish in the disposal of their food. The Leicester is essentially a Bear in character, laying on fat for hard times, and hence the abundant supply of milk is not prominent on an average. Lambs come with a delicate bearing, but once over the first month their progress is wonderful. Friend Bakewell's soda-water bottle is still a feature in their build, and so also is the want of wool below on young as well as old animals. Thus we have evidence of the prepotency of the Leicester, The fattened wether with us is simply an extraordinary piece of mutton—I mean the shearling wether, as nothing older is admissible in these days of sharp profits—the immense depth, breadth, and prominence of the fore-quarters, the filling in of the arms and thighs, and the general bunching of outside fat is a fine piece of study—peculiar and curious. Who would eat it? Not many by choice, certainly, and very few by compulsion, when the shearling weighs 307 pounds, as we had this year.

The Southdown.—England's choice mutton—the great little breed of its chalk hills. We purposely place this after the Leicester as in our opinion it is a Leicester in build and maturing. It is difficult to do justice to this breed with pen and ink, because it is easier to describe a faulty animal than a perfect one.

I desire to record without any touch of doubt that the Southdown is unmistakably our best friend at Guelph. I say Guelph, because, as in any sheep life, conditions of climate, altitude, soil, vegetation, and management affect so strikingly, even on neighbouring farms. Friend here means one and one-half lamb per ewe—coming early, strong, plump, and with all the build of a mature animal. The average weight of a *newly-born* lamb is as heavy as the average of any other breed. The Southdown is a splendid mother—doing as well to two as the Cotswold does to one lamb; no doubt she does not do so on nothing, as in comparison with size, she is a great forager. So prominent is this breed in milking properties that any difficulty we have had in udder affections has been with it. The Southdown do not go and come in flesh so much as any of the other breeds in our hands, and they are much less subject to disease, and when under any trouble they recover sooner and are more reliable afterwards. These are very marked facts in our experience—away above all doubt.

In regard to fattening and the power of improving other breeds, or rather the production of value of wool and mutton with the common grade ewes of the country, it is on record elsewhere in this report that while less in weight there is a value of these products that places the Southdown second to nothing, and equalled only by the Shropshire.

The Cotswold.—We have had a larger flock of Cotswolds than others and as true animals of their kind, as in any others. The grey-faces and the larger stamp of the white-faces have been handled here. One and one-fourth lamb per ewe is the average produce. They do not come so strong and so well made up as the Southdowns, but once fairly into milk and extra food make rapid progress. The ewes are moderate mothers, and great eaters. We have no breed so liable to catarrh, or "snifters," as this, and we hear the same complaint from other breeders. Sudden change of weather, a wet bed, or any unusual climatic condition is sure to bring nose runnings. Even the newly-born lamb is sometimes affected. The Cotswold maintains wool in quantity and quality well, and longer than the Leicester. In fattening we cannot finish them so early as the Leicester, Southdowns and other Downs, and they are slower at taking on the "last dip,"—but for great weights nothing can beat them.

The Merino.—The extremes in sheep life with us are the Cotswold and Merino—the size and coarse wool of the one against the size and fine wool of the other; they are alike in slower maturing—the Merino is too unsettled, and too much of the race-horse stamp to fill our views of a modern mutton producer. But, practically, our experience in pure breeding has been very limited—has been more in the line of testing the value of the offspring of a very fine French ram with the common ewes of the country. The marking in frame and wool is most striking—never doubtful, even to the temper. Wool from hoof to horn—wool everywhere, except a small part of the face and muzzle on the grade. The clip, in weight and quality, stands high, and the fattened shearling wether has surprised us in weight and good handling, as to which see special notes in this report on killing of various grades.

The Shropshire.—We like this breed for several good reasons proved by our own experience. It is reliable in breeding and prepotency, the ewes hold flesh easily and without danger, are average mothers—not equal to the Southdown—prolific, averaging one and one-half lamb; give a heavy close crop of medium long wool of fine texture and average lustre. In weight of carcase and wool it stands between the Southdown and Oxford Down. In competition with the five other breeds the Shropshire is equalled only by the

Southdown in value of annual productions, and where extreme quality of flesh and wool is not the sole object of the flockmaster, but more weight of both crops and somewhat less quality, then the Shropshire will lead in much of our future in Ontario.

The fattened grade wether is a nicely balanced piece of mutton, a little on the late side of maturing, not broad enough in the forequarters to some minds, and just a little leggy, but grand quality in bone as well as handling.

The Oxford Down—The most modern of imported sheep, and showing much of the size and nobility of one of their progenitors—the Cotswold. If it be true that the issue of a Cotswold ram with a Hampshire ewe, put to a Southdown ram, was the origination of this breed, then Cotswold power must be strong, because, as I have said, size holds, and the more open and coarse staple of wool also tells of Gloucestershire influence.

We had the honour, practically, of introducing this breed into Canada in 1876, when advised to purchase Lincoln, we preferred to give the Oxford Down a place. Anticipations have been very satisfactorily realized. For early maturing, maintenance of weight, power to produce through the common Canadian, making good mothers, and giving *one and two-thirds* lambs per ewe, no other breed equals the Oxford Down, on an average. Value in these times, of course, is not necessarily implied in such a strong statement as this, but, to those who desire a medium wool—on the long side, somewhat open and coarse, comparatively to other Downs—a heavy fleece, a strong, square frame, early flesh of good quality, with ability to reproduce these through a common source, the Oxford Down must command a high place.

3.—Our Sales of Live Stock.

Since our original investment of \$8,000 for imported live stock in 1876, and \$2,000 of subsequent purchases up to 1881, we have sold surplus animals to the value of \$15,600 and retained part of its produce, valued at \$3,000. Thus, then, \$10,000 have given us \$18,600 in an average of five years. This is no remarkable result in respect to rapid returns, but in other ways it may be called an unusual thing for a public institution. The surplus stock consisted of fifty head of cattle, and five hundred sheep, of five breeds each, all pastured. Excepting British Columbia, every Province of the Dominion can speak of possessing blood from us, and we have had but two cases of disappointment. At every public sale, and particularly that of 1882, the disappointment expressed, very plainly, has been in regard to our want of materials in numbers to meet the demand. "Why don't you import more—\$50,000 in place of \$7,000, so that the small farmers may have a chance of something good, and always unreserved, as you have done, and not have so many bidding against each other, until prices are too much for us?" We have only heard of one instance of jealousy on the part of a breeder, who imagines that our handful affects the market to his disadvantage—a few cattle and sheep merely on this great continent! In place of this narrow view of our position as breeders, it stands as a clear fact in the knowledge of every unprejudiced critic, that our work here in experimenting with cattle and sheep is systematic and healthy production of young animals, and in laying before the country the leading features of the live stock interest year after year, and so to increase the demand as to materially improve the markets of the Province—creating at least a keener interest in certain lines of cattle and sheep.

You have allowed me to call attention to the repeated high offer that we have received privately for certain animals, and that I am entitled to show these as actual increased value of stock on hand, which should annually be placed to the credit of the farm. This is business, and but fair to the institution. To give an idea of this phase of our position, take the following memorandum as applicable to the year 1880, 1881, and 1882:—

	Original Cost.	Have been Offered.
Two-year old Hereford heifer	$150	$ 400
Grade Shorthorn cow, five years old	50	135
Aberdeen poll grade cow	40	150
Hereford cow, 8 years old	260	600
Aberdeen poll bull, 2 years old	450	800
Hereford bull, 2 years old	450	800
Aberdeen poll heifer, 2 years old—imported	400	2,000
Aberdeen poll cow, 3 years	200	800
Southdown ram lamb	100	130
Total	$2,100	$5,815

Public Sale of Surplus Live Stock, September 13th, 1882.

Lot.	Class.	Purchaser, Etc.	Amount.	Total.
	CATTLE.			
	Shorthorns—		$ c.	$ c.
1	Heifer calf	W. A. Webster, Lansdowne	112 00	
2	" "	J. & R. Hunter, Alma	102 00	
3	Bull calf	Robt. Reilly, Marnoch	120 00	
4	" "	S. J. Hogarth, Exeter	91 00	425 00
	Herefords—			
5	Heifer calf	R. J. Mackie, Oshawa	150 00	
6	" "	" "	138 00	
7	Bull calf	W. Howitt, Guelph	215 00	503 00
	Devons—			
8	Heifer calf	Geo. Rudd, Puslinch	82 00	
9	Bull calf	" "	45 00	127 00
	Ayrshires—			
10	Heifer calf	E. B. Somerville, Belfast	61 00	
11	Bull calf	Bradley & Roth, Lansdowne	56 00	117 00
	Jerseys—			
12	Bull calf	H. Sorby, Guelph	100 00	100 00
	SHEEP.			1272 00
	Cotswolds—			
1	Shearing ram	Allan Ramsay, Eden Mills	38 00	
2	" "	H. Sorby, Guelph	16 00	
3	" "	J. Nightingale, Prince Edward County	29 00	
4	" "	J. Elder, Rodgersville	61 00	
5	" "	Jno. Carter, Puslinch	28 00	
6	Ram lamb	R. F. Seymour, Sleswick	10 00	
7	" "	Andrew Rowand, Walkerton	18 00	
8	" "	J. V. Snell, Edmonton	15 00	
9	" "	Robt. Gowanlock, Maple Hill	9 00	
10	" "	Jno. Matherson, Lucknow	16 00	
11	" "	Jas. Auld, Guelph	16 00	
12	" "	Thos. Card, Guelph	14 00	
13	" "	W. Buchanan, Flesherton	13 00	
14	" "	S. J. Lyons, Norval	25 00	
15	" "	D. Hanmer, Mt. Vernon	31 00	
16	" "	Jno. Darroch, Cotswold	6 00	
17	" "	W. Sykes, Lennoxville	40 00	
18	" "	W. A. Webster, Lansdowne	7 00	

PUBLIC SALE OF SURPLUS LIVE STOCK, SEPTEMBER 13TH, 1882—*Continued.*

Lot.	Class.	Purchaser, Etc.	Amount.	Total.
	SHEEP.		$ c.	$ c.
	COTSWOLDS—	*Brought forward*		1272 00
19	Ram lamb	Robt. Hyslop, Paris	9 00	
20	" "	C. M. Smison, Almonte	7 00	
21	" "	Wm. Spark, Petherton	12 00	
22	" "	Willis W. Beamer, Grimsby	11 00	
23	Ewe lamb	Allan Ramsay, Eden Mills	26 00	
24	" "	W. A. Scholman, Mildmay	18 00	
25	" "	James Edmonstone, Johnstone	25 00	
26	" "	W. Rowand, Walkerton	29 00	
27	" "	Jas. Watson, Eden Mills	29 00	
28	" "	Wm. Ramsay, Eden Mills	20 00	
29	One pair aged Ewes	Robt. Hermiston, Mt. Forest	30 00	
30	" "	Benj. Storey, Picton	16 00	
31	" "	Robert Shortreed, Guelph	17 00	
32	" "	Robt. Fuller, Mitchell	26 00	
33	" "	" "	27 00	
34	" "	W. A. Scholman, Mildmay	28 00	722 00
	LEICESTERS—			
35	Two-shear ram	H. Glazebrook, Simcoe	53 00	
36	Shearing ram	N. Norrish, Nassagewaya	31 00	
37	Ram lamb	David Elliot, Grafton	16 00	
38	" "	Jas. Henry, Marnoch	27 00	
39	" "	Abraham Rowand, Walkerton	22 00	
40	One pair ewe lambs	Robt. Hermiston, Mt. Forest	15 00	
41	" "	John Douglas, Tara	15 00	179 00
	OXFORD DOWNS—			
42	Shearling ram	J. Anderson, Arthur	46 00	
43	Ram lamb	" "	33 00	
44	" "	John Alliston, Fergus	36 00	
45	" "	Richard Rennelson, Galt	25 00	
46	One pair ewe lambs	Wm. Howitt, Guelph	62 00	
46 (A)	" "	" "	100 00	302 00
	SHROPSHIRE DOWNS—			
47	Three-shear ram	Richard Rennelson, Galt	65 00	65 00
	SOUTHDOWNS—			
48	Aged ram	John Douglas, Tara	25 00	
49	Shearing ram	Dr. Coleman, Belleville	36 00	
50	" "	Chas. Kay, Fergus	31 00	
51	Ram lamb	D. McLennan, Glengarry	10 00	
52	" "	Walter West, Guelph	14 00	
53	" "	R. Hermiston, Mt. Forest	10 00	
54	" "	John Irvine, Harriston	11 00	
55	" "	L. Weller, Zephyr	12 00	
56	" "	Geo. Muir, Cumnock	10 00	
57	" "	A. Elliott, Galt	15 00	
58	" "	John Cook, Lansdowne	17 00	
59	" "	Chas. Kay, Fergus	25 00	
60	" "	" "	16 00	
61	One pair ewe lambs	John Cook, Lansdowne	26 00	
62	" "	Wm. Howitt, Guelph	31 00	
63	" "	" "	25 00	
64	" "	Dr. Coleman, Belleville	38 00	352 00
	PIGS.			
	BERKSHIRES—			
1	Boar	R. F. Seymour, Sleswick	25 00	
2	"	Mossom Boyd, Bobcaygeon	24 00	
4	"	S. Sorby, Guelph	21 00	
3	"	R. Hermiston, Mt. Forest	12 00	
5	"	D. McLennan, Glengarry	7 00	
6	Sow	D. Belzner, Salem	6 00	
7	Boar	D. Snyder, Roseville	5 00	
8	Sow	Jos. Edmonstone, Johnston	5 00	
9	"	R. F. Seymour, Sleswick	5 00	110 00
		Gross total		$3002 00

IV.—THE EXPERIMENTAL DEPARTMENT.

We have to record an important change in the Field division of this branch of our work. Hitherto all the many details of modes of cultivation, manuring, testing of crops, and sample growing, have been confined to an area of four acres adjoining the farm buildings and paddock. This field is already broken by a new cottage for the farm foreman, and it is in the plans of the future to remove the present barns to the centre of these four acres—thus, practically our old experimental plots are blotted out; indeed we have already ploughed all over in view to seeding down to permanent pasture in spring so as to secure more room for calves and any other special cases of live stock.

In memory of what has afforded so many lessons to thousands of visitors, some seven hundred students, and myself, take a brief *résumé* of what these four acres have said—whether yes or no, during the last seven years.

In the testing of over one hundred varieties—so called—of winter and spring wheat, while nothing remarkable has been elicited, yet some practical good has been placed to our credit, particularly in showing the adaptability or not of certain European and American kinds to our conditions of climate, in the distribution of a few of the best among our farmers, in admitting a thorough comparison as they stood side by side in the plots, in noting their conduct under various forms of disease, and generally their educational value to the students and others.

With over thirty distinct kinds of oats, a proportionately greater success has been achieved. A very thorough test of their capabilities for Canadian cultivation has been made—on different soils and at different stages of a rotation. In their conduct we have found very distinct differences in liability to rust and smut under precisely similar conditions, and the weight and quality of straw was also very marked. As a whole we are satisfied as to the average reliability of the "side" as against the "branched" varieties, and that the Black Tartarian is most suitable—a greater yield per acre, with medium straw, a fuller head, plumper grain, and thinner skin.

We have proved the good and the bad of some ten varieties of barley, have tried England's best ones with considerable satisfaction, and have bid good-bye to those from Russia. In two-rowed sorts, produce per acre is not equal to the six-rowed, and generally the six is most suitable for Ontario.

There is no kind of pea equal to the Golden Drop and common White for field produce in our conditions, and we have tried five of them. The larger sorts, with stronger straw require stronger soil and possibly a less severe climate than those obtaining in the Guelph district. Nothing else requires mentioning in their cultivation.

The American cereal called *Corn*, is not a success eight hundred and eighty feet above our fresh water seas, as it is unquestionably in other districts not over thirty miles distant. I do not mean that we cannot grow the grain of some of the hardier kinds, as we can, but that under every variety of soil and season over seven years they have not been so valuable as other crops. Their stalk and leaves stand, however, as a subject of paramount importance for green fodder both in summer and winter.

The establishment of more kinds of grass than timothy has been a line of our experimental work of great interest and considerable success. We have most thoroughly tested five kinds, and proved their reliability for all parts of the Province on the assumption reasonable enough, that what succeeds with us on a high-lying and exposed situation will hold good almost everywhere else in the same country. We have regularly grown all the well-known British grasses, never less than twenty varieties, by seeding separately and in association, on different plots, and consequently can speak of their habits under various conditions, of their failures, their early or late maturing, their tillering, their sociable or unsociable habits, their power in re-seeding, their durability in autumn, and their conduct under drought and much moisture.

Clovers as suitable for hay and pasture have been treated similar to grasses and with pretty decided results. We have nothing more to say to Bockhara and the Crimson, but a great deal to recommend about Lucerne and Sain-foin—Lucerne particularly.

The study of green fodder as distinct crops under systematic cultivation for special soiling as well as aids to pasturing, has been well attended to here. We have repeatedly

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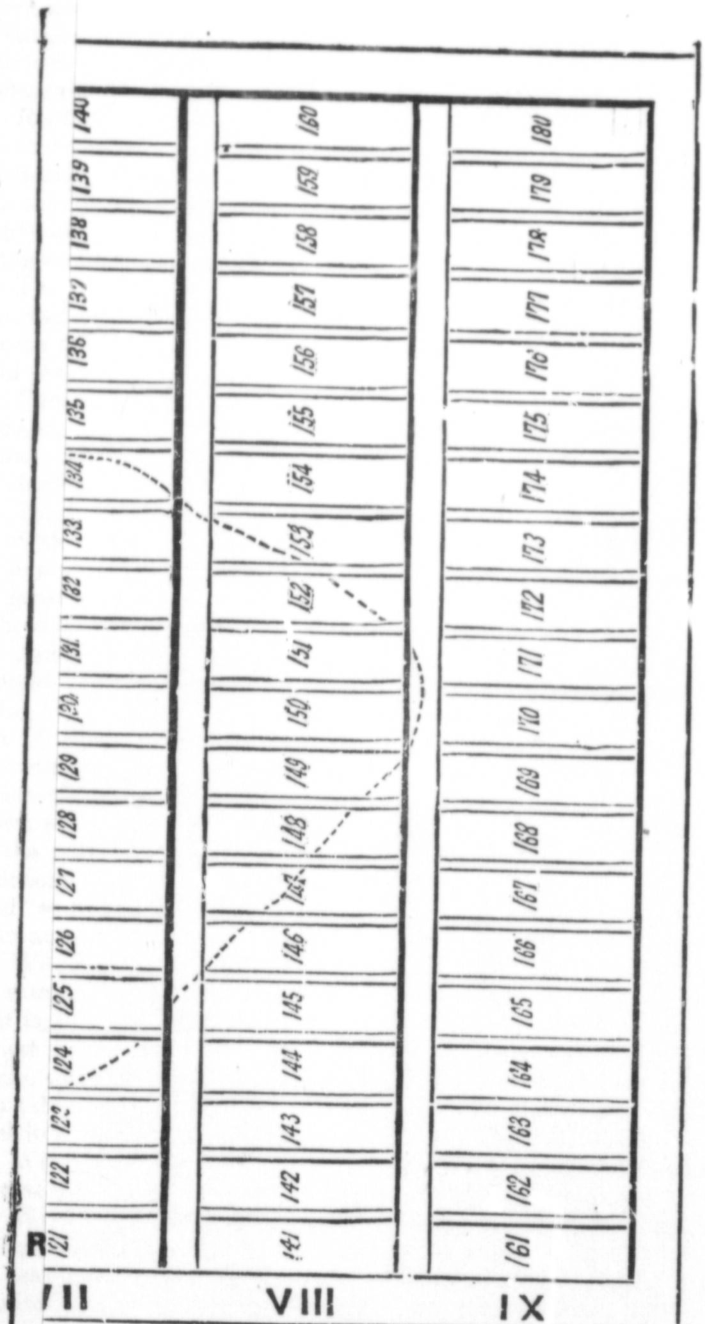

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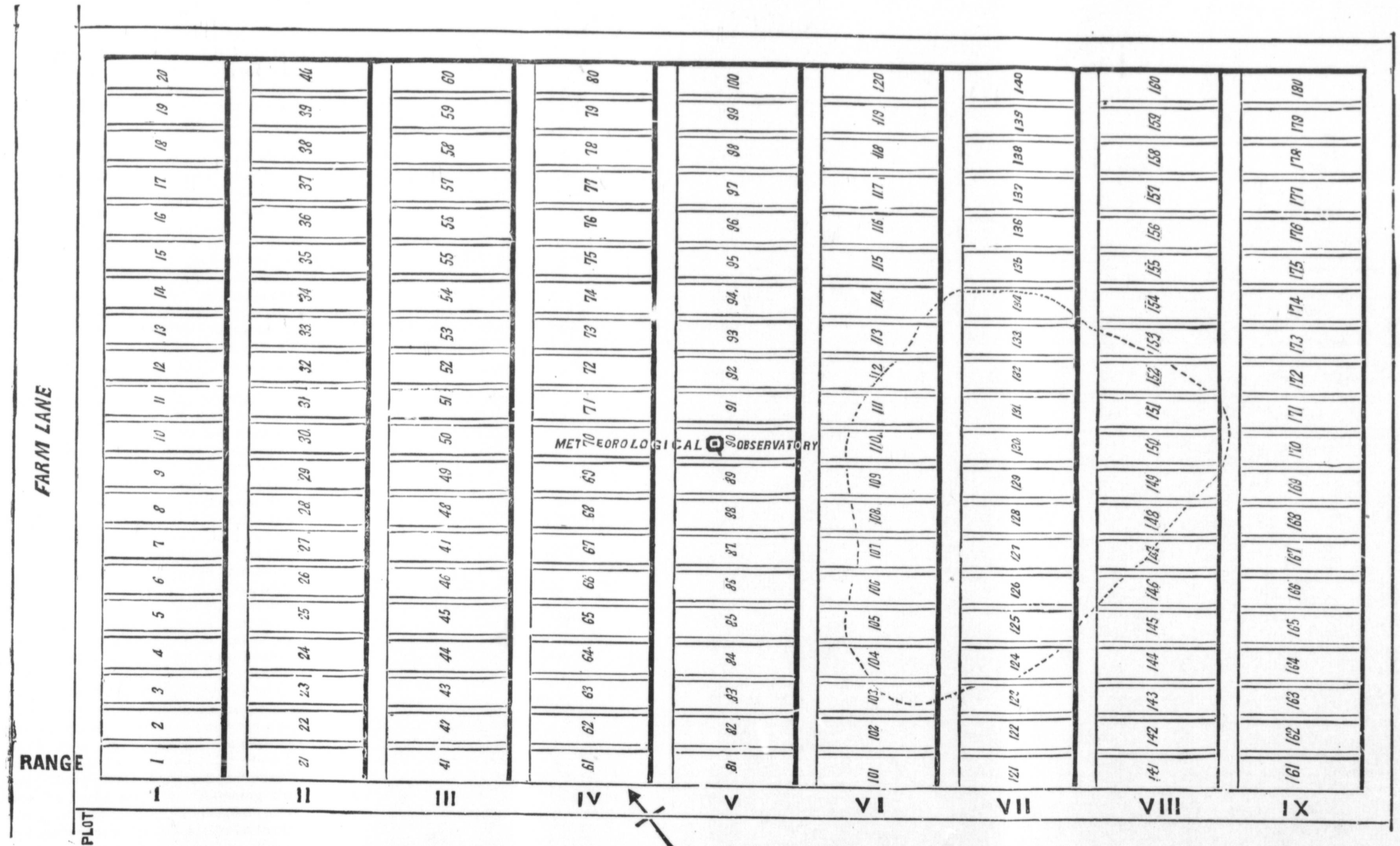
ONTARIO EXPERIMENTAL FARM.

EXPERIMENTAL FIELD PLOTS

(Field 14 of Farm.)



Area of each Plot—$\frac{1}{10}$ of an acre.
Width of Range Roads—20 feet.
Width of Plot Paths—$4\frac{1}{2}$ feet.

SOILS { Ranges I. to V.—Clay Loam.
Ranges VI. to IX.—Gravelly Loam.
Within dotted line—Vegetable Mould.

Scale—One inch to 132 feet.

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proved the hardiness, permanency, early maturing, four cuttings per annum, and the high feeding value of the Alfalfa or Lucerne—never doubtful, never ungrateful under proper management. Of the dozen varieties of plants thus handled, we can point to one as still questionable: The Prickley Comfray has disappointed. It is hardy enough, offers a fair cut every month from May to September, but so long as other fodders can be had no class of animals care for it in any form, in our experience.

Root crops have not been neglected, and much information gathered. No fewer than thirty varieties of turnip, mangold, sugar beet and carrot have been cultivated. Practically, the farmer need not trouble himself with more than five, three, and two kinds respectively, when our wants are told by weight per acre, good keeping properties and quality as food. No doubt, soils regulate the selection of kinds as well as class, but good management will produce heavy crops of all on almost any soil in Ontario.

The form of grass called sugar cane, has been successfully matured in our high latitude and altitude, and thus establishes an important fact either for fodder or sugar. Growth during the first month is not nearly so vigorous as corn, but afterwards makes rapid progress and finishes as quickly.

Every year over twelve sorts of potatoes have been experimented with, but no mode of management, manuring, or kind of soil can make any equal to the Early and Late Roses. They stand unequalled in produce, keeping properties and quality, thus then but corroborating the most of other provincial experience.

These and other crops of minor importance go to make up our field crop experimental bill of the past. How many successes, and how many failures, it would be difficult to tell exactly, and few people are aware of all the care, judgment, watching, comparing, and general supervision, that has been exercised, well or indifferently, through so much in these long seven years.

Another branch of our experimental work has been the testing of fertilizers upon different crops. This is all the world over a very wide and much unknown field still engaging the best efforts of all the best men of all civilized countries. What shall we say then of Ontario's position as an associate of science and practice. Very many of the most important facts in other lands are clearly inapplicable to us, simply because climatic conditions are so very different. The great regulators of fertilizers, everywhere, are known to be, (1) their form, (2) their mode of application, (3) their time of application, (4) the physicial character of the soil, (5) amount of rainfall, (6) and other climatic conditions; but principally form, soil, and climate. So then, when will Ontario be able to tell what all her soils, and the ever varying rainfall and temperature by districts, will, on an average, demand to give the best results.

We have made a beginning; it has taken just seven years to make a beginning, just one rotation in cropping. Less would not have done, more would have done no harm. As it is, we are now able to speak experimentally; the experimental world and some of its best men have recognized us as one of themselves. In this regard we do not blush to take a place, because, though fruit, in the view of the jealous and impatient, has not been tabled as they think, yet we feel confident of exact aims, of a valuable cause, and of ultimate success far above what can be estimated.

We have made the acquaintance of nitrate of soda, salt, lime, gypsum, phosphate, mineral superphosphate, bone dust, bone superphosphate, and farm-yard manure.

With these, singly, and in combination through some twenty forms, we have made preliminary trials upon the more important field crops. The experience gained to date I can designate by no better term than "puzzling." To say uncertain would not convey my meaning, for I wish to convey something that has been certain in the sense of realizing some things that of themselves were plain enough but *unexpected*. An unexpected thing in our profession is one that comes against the teachings of science on the one hand and what we have to compare with in actual practice on the other hand. Now, science of itself is steady enough, and may be depended upon when the exact conditions exist for its teachings—never otherwise—but when great washings of rain, or very little rain, great heat or unusual cold, and even extremes of physicial conditions of soils pertain, then things puzzle and we do not know where we are. This is especially the case in our individual position as experimentalists in Canada, so all the science and practice we read about from

Europe and the United States where physicial conditions differ so materially from ours are of little use to us either as a guide or in checking results. In one word, so strong and overruling are climatic conditions with us that it will take many years to make a good average suitable to all variations.

I need not say more at present other than to express the hope that the Government will deal liberally, and the country bear patiently, with the farmers' only direct public indulgence—their Experimental Farm.

Our New Experimental Field Plots.

Our old experimental plots having had to be broken up, as explained in the foregoing chapter, it became necessary to establish others. For this purpose field fourteen of the farm has been chosen for the following reasons:—It is the most uniform in exposure and aspect, of any convenient to the College; it is one of our largest fields, almost twenty-four acres, has been recently drained, and possesses soil of three different characters, as shown on the accompanying plan.

In preparation for 1882-83 work, this field was thoroughly fallowed by four ploughings during the past summer, the removal of any obstacles to the plough, the levelling of parts adjoining fences, and the digging of all the ground close to the fences where the plough could not reach. On the north-east side a row of maples has been planted; horse chestnut on the south-east end; mountain ash on the south side, and European lindens on the north-west end, with a view to a certain amount of shelter and ornament.

In considering the sub-division of this field into plots suitable for any purpose, we see no reason to depart from our old area of *one-tenth of an acre*, as to which see my report of 1876. This, of course, implies an easy making of a fifth, or a twentieth, or even a fortieth of an acre, if necessary. The field has been divided into nine ranges, containing each twenty plots, so that there are actually as many as *one hundred and eighty plots.*

Each range is separated by a twenty feet road, and between each plot there is a four and one half feet path. Thus, all over, we think we are up to times in regard to area, form, and position of plots. The form of 132 feet by thirty-three feet lying north-west and south-east is one well adapted to receive the full measure of sunshine—beginning with the morning broadside, the noonday sweep, and the evening touch, each in its largest measure. There is a road over twenty feet in width round the field, between fence and plots. One objection to this form of plot is the greater length of boundary, as against a square—364 feet and 264 feet. It is a well known fact in practice that in any field, plot, or bed, the *outside* plants are stronger, by reason of the better light, air, and sunshine; so then, the greater the boundary line the heavier the crop, proportionately to inside area; this is so plainly a fact in experimental work—often overlooked however—that the difference of one hundred feet to a small area, such as one-tenth of an acre, might over-balance a fine point between two fertilizers, and certainly as one hundred feet is to one-tenth there must be at least 1,000 feet to an acre, and accordingly multiplying to a very serious extent—for experimental accurateness.

There are three distinct classes of soil in our new experimental field; from range two to range five, inclusive, it is a clay loam of average texture, with a yellowish subsoil of a sandy character; the remainder of the field, with the exception of the swampy part—is of a lighter, sharper class, which we call a gravelly loam; and about two and one-half acres, as indicated by the dotted line on plan, are a swamp that has been drained, burned, thoroughly cultivated by ploughing and harrowing, cleaned of all roughness, and is now a spot of virgin soil—never having been cropped—of the vegetable mould type.

Such is our new experimental field proper, on which, in future years, may depend much of the status of Canadian agriculture.

The cropping of those plots has been a matter of some study—just what to do in connection with the existing, or the probable future, requirements of Ontario's rural economy. Of course our past experience has indicated several things, and by reference to what Europe and the United States are doing in the same line, we have concluded upon the following plan:—

FIELD PLOT EXPERIMENTS BEGINNING 1883.

I.—Soils.

Two plots to be divided into eight parts, each to be made up to the depth of two feet with the following soils: (1) Heavy clay; (2) clay loam; (3) loam; (4) sandy loam; (5) swamp; (6) gravelly; (7) marly; (8) sand. These to test manures under the like conditions of management and climate—the physical conditions of soils affecting manures very differently.

II.—Cultivation.

1. Rotations, three sets	One plot to each.
2. Cultivating cereals, say wheat	1 plot.
3. Non-cultivation, "	1 "
4. Subsoiling, "	1 "
5. Drainage, effects of rain in withdrawing manures	2 "

III.—Seeding.

1. Thick seeding	1 plot.
2. Thin "	1 "
3. Drilling "	1 "
4. Broadcast "	1 "
5. Deep "	1 "
6. Shallow "	1 "

IV.—Cropping.

1. Winter wheats, varieties	10 plots.
2. Spring wheats, "	10 "
3. Oats "	10 "
4. Barley "	10 "
5. Rye "	2 "
6. Peas "	3 "
7. Roots—mangolds, turnips, carrots—varieties	11 "
8. Potatoes, varieties	5 "
9. Corn "	4 "
10. Grasses and clovers, separately	20 "
11. Green fodders	6 "
12. Permanent pastures, various mixtures	3 "
13. Sundry crops	2 "
14. Sugar beet	1 "
15. Sugar cane	2 "
16. Crop after crop of wheat upon virgin soil (clay loam)	2 "

V.—Unmanured Plots.

Unmanured plots	4

VI.—Manuring.

1. Farm-yard manure, best management of, from uncovered court	1 plot.
2. Farm-yard manure from covered court	1 "
3. Farm-yard manure from poorly fed animals	1 "
4. Farm-yard manure from well fed animals	1 "
5. Fertilizing by sheep (diff. soils)	2 "
6. Farm-yard liquid (diff. soils)	2 "
7. Clean straw, rotting on surface	1 "

8.	Clean straw, ploughed under	1 plot.
9.	Compost (diff. soils)	2 "
10.	Clover (diff. soils)	2 "
11.	Bare fallow (diff. soils)	2 "
12.	Sewage from College (diff. soils)	2 "
13.	Marl (old and new)	2 "
14.	Phosphate (apatite)	2 "
15.	Superphosphate	1 "
16.	Bones, fine ground	1 "
17.	Bone superphosphate	1 "
18.	Gypsum	1 "
19.	Leached ashes	1 "
20.	Lime (var. soils)	1 "
21.	Salt (var. soils)	1 "
22.	Mixtures of several manures	2 "
23.	Various *quantities* of several manures	5 "
24.	*Special* manures	5 "
25.	Fall *vs.* spring manuring	3 "
26.	Manures applied at various stages of growth, same season	4 "
27.	Duplications of several	2 "
28.	Nitrate of soda	5 "

VII.—Modes of preventing and curing diseases of farm crops.

VIII.—Special nitrogen experiments, as fully and ably explained in the following letter from our chemist, Dr. Hare:—

SIR,—It has been at the request of Prof. Brown that I have become an associate with him in the direction of the field experiments of the Ontario Experimental Farm, and that I now submit for your consideration the following suggestions with regard to the *system of fertilizing* to be used in connection therewith. A study of the field experiments lately published by Lawes and Gilbert, of England, and by the experimental stations of Germany and the United States, has led me to consider a system of *coöperative experimenting* as the only one that can hope to secure general, definite and abiding results. The system of coöperative experimenting to be truly successful should provide that the fertilizing materials may be used separately, two by two, and altogether. It is by this method only that the effects of the ingredients separately and the capacity of the soil to supply them, as well as the *heightened effect* on the one fertilizer by the addition of other fertilizers may be accurately discovered. A most careful examination of the physical and chemical character of the soil should precede and accompany the experiments in order, if possible, exactly to formulate the effects of the fertilizer and the feeding capacities of different plants. Assisted by Prof. Brown, four cross-sections of surface soil and subsoil, from characteristic portions of the experimental field, have been made. We have already begun an analysis of them, which we propose, with the analyses of some of the experimental crops, publishing in next year's report.

We are in full accord with Prof. W. O. Atwater's system of coöperative experimenting as submitted to the Department of Agriculture, Washington, D. C., March 27th, 1882, under the heading, "Coöperative Experimenting as a Means of Studying the Effects of Fertilizers and the Feeding Capacities of Plants." Prof. Atwater has proposed this system as the *best practical* explanation man can give of the two important subjects which were discussed at the Washington Convention for coöperative experiment. The questions were:—

(1) The supply of nitrogen to plants.
(2) The action of phosphoric acid in different forms of combination and in different fertilizing materials upon the growth of plants. The action of nitrogenous and phosphatic fertilizers (potassic as well) upon the growth of plants is really the great agricultural question of to-day.

I.—The Supply of Nitrogen to Plants.

We think with Prof. Atwater that a dressing of 450 pounds of nitrate of soda per acre, probably as large as would be used in this country, in ordinary practice, on ordinary crops. We have adopted this maximum, "full ration," which at sixteen per cent. would contain seventy-two pounds of nitrogen, and the divisions of it into two-thirds, one-third, one-sixth, and one-twelfth rations.

Nitrogen Rations.

(*a*) One-twelfth ration: Nitrate of soda 38 pounds, with 6 pounds of nitrogen.
(*b*) One-sixth ration: Nitrate of soda 75 pounds, with 12 pounds of nitrogen.
(*c*) One-third ration: Nitrate of soda 150 pounds, with 24 pounds of nitrogen.
(*d*) Two-thirds ration: Nitrate of soda 300 pounds, with 48 pounds of nitrogen.
(*e*) Full ration: Nitrate of soda 450 pounds, with 72 pounds of nitrogen.

As nitrogen exists in different forms, and each form may have a distinct action upon the growth of plants (under the varying conditions of crop, soil, climate, season, etc., etc.), the question of the supply of nitrogen to plants is only answered when the *feeding capacities* of different plants to nitrogen in all its forms are carefully studied and accurately formulated. We give Prof. Atwater's classification of the important kinds of fertilizers containing nitrogen:—

I.—Nitric Acid: (*a*) Nitrate of soda.
(*b*) Nitrate of potash.

II.—Ammonia: (*a*) Sulphate of Ammonia.

III.—Organic Nitrogen: (*a*) Dried blood.
(*b*) Meat scrap.
(*c*) Fish scrap and fish guano.
(*d*) Leather scraps.

We have concluded to take:

For Nitric Acid—Nitrate of soda with 16 per cent. nitrogen;
For Ammonia—Sulphate of ammonia with 21 per cent. nitrogen;
For Organic Nitrogen—Dried blood (steam dried) with 11 per cent. nitrogen.

The "nitrogen mixture," consisting of equal parts of nitrate of soda (16 per cent. nitrogen), sulphate of ammonia (21 per cent. nitrogen), and dried blood (11 per cent. nitrogen), and containing 16 per cent. nitrogen, we shall also use. These four kinds of nitrogenous fertilizers with the quantities per acre, as suggested by Prof. Atwater, will require twenty different experimental plots. By making the plots one-twentieth of an acre each, one acre will serve the four groups. The four groups with the quantities per acre will be as follows:—

—	Ration.	Nitrate of Soda	Per cent. of Nitrogen.	Quantity of Nitrogen.
		Pounds.		
I.—Nitrate of Soda group.	One-twelfth	38	16	6
	One-sixth	75		12
	One-third	150		24
	Two-thirds	300		48
	Full	450		72

—	Ration.	Sulphate of Ammonia.	Per cent. of Nitrogen.	Quantity of Nitrogen.
		Pounds.		
II.—Sulphate of Ammonia group.	One-twelfth	29	21	6
	One-sixth	57		12
	One-third	114		24
	Two-thirds	228		48
	Full	343		72

—	Ration.	Dried Blood.	Per cent. of Nitrogen.	Quantity of Nitrogen.
		Pounds.		
III.—Dried blood group.	One-twelfth	55	11	6
	One-sixth	110		12
	One-third	220		24
	Two-thirds	440		48
	Full	660		72

—	Ration.	Nitrogen Mixture.	Per cent. of Nitrogen.	Quantity of Nitrogen.
		Pounds.		
IV.—"Nitrogen Mixture" group.	One-twelfth	38	16	6
	One-sixth	75		12
	One-third	150		24
	Two-thirds	300		48
	Full	450		72

II. In reference to the second question, "The action of phosphoric acid in different forms of combination, and in different fertilizing materials upon the growth of plants," a course similar to the one we have indicated for the nitrogen will be followed. We think that the action of *soluble phosphoric* acid, *precipitated phosphoric* acid, and *insoluble phosphoric* acid upon the growth of plants must be ascertained separately before this most important question can be answered, or a correct comparison of the relative value of these forms of phosphoric acid can be given. For the *soluble* phosphoric acid, Prof. Atwater suggests: "Dissolved bone black with 16 per cent. P_2O_5; or high-grade Superphosphate with 32 per cent. P_2O_5;" for the precipitated *phosphoric* acid, "A high-grade superphosphate with equal weight of chalk, making a precipitated phosphate, with 16 per cent. P_2O_5;" for *insoluble phosphoric* acid, "Fine bone dust (mesh, 40) from steamed or raw bone, with 25 per cent. P_2O_5; or mineral phosphate with 25 per cent. P_2O_5."

We give a slightly enlarged statement of Prof. Atwater's scheme for the phosphoric acid group, with the quantities per acre :—

Quantities of Phosphoric Acid.

—	Ration.	Dissolved bone black.	Per cent. P_2 O	Quantity P_2 O_5
		Pounds.		
I.—Soluble Phosphate group. (Superphosphates).	One-sixth	100		16
	One-third	200	16	32
	Two-thirds	400		64
	Full	600		96
—	Ration.	Precipitated Phosphoric Acid	Per cent. P_2 O_5	Quantity P_2 O_5
		Pounds.		
II.—Precipitated Phosphate group.	One-sixth	100		16
	One-third	200	16	32
	Two-thirds	400		64
	Full	600		96
—	Ration.	Fine steamed or raw bone.	Per cent. P_2 O_5	Quantity P_2 O_5
		Pounds.		
III.—Insoluble Phosphate group (*a*) Ground bone.	One-sixth	67		16
	One-third	133	25	32
	Two-thirds	267		64
	Full	400		96
—	Ration.	Mineral Phosphate, finely powdered.	Per cent. P_2 O_5	Quantity P_2 O_5
		Pounds.		
IV.—Insoluble Phosphate group (*b*) Mineral Phosphate, finely powdered.	One-sixth	67		16
	One-third	133	25	32
	Two-thirds	267		64
	Full	400		96

III.—The Potash Group.

Taking for the minimum of muriate of potash, 17 pounds per acre, and for a maximum 200 pounds per acre, and dividing as before, we shall have :—

—	Ration.	Muriate of Potash.	Quantity of Potash.
		Pounds.	
Muriate of Potash group.	One-sixth	33	17
	One-third	67	33
	Two-thirds	133	67
	Full	200	100

The phosphoric acid group and the potash group will require twenty plots—phosphoric acid group sixteen plots, and the potash group four plots. If the plots be made $\frac{1}{20}$ of an acre each, an acre will accomodate these two elementary groups.

Complete Fertilizers.

It is possible, that a mixture of superphosphate and potash must be added to the nitrogenous materials, before the full effect of the nitrogen becomes manifest. This being so, we shall follow the suggestion of Prof. Atwater, and take two-thirds rations of superphosphate and muriate of potash (400 pounds of superphosphate and 133 pounds of muriate of potash), and add them to the several rations of the nitrogen group :—

—	Fertilizing Materials.			Ingredients.					
I.—Nitrate of Soda mixed group. Ration.	Nitrate of Soda. pounds per acre.	Superphosphate pounds per acre.	Muriate of Potash pounds per acre.	Nitrogen pounds per acre.	Phosphoric Acid pounds per acre.	Potash pounds per acre.	Nitrogen per cent.	Phosphoric Acid per cent.	Potash per cent.
One-twelfth	38	400	133	6	64	67	1.5	11.2	11.7
One-sixth	75	400	133	12	64	67	2.0	10.5	11.0
One-thirds	150	400	133	24	64	67	3.5	9.3	9.8
Two-thirds	300	400	133	48	64	67	5.8	7.6	8.0
Full	450	400	133	72	64	67	7.3	6.5	6.8

—	Fertilizing Materials.			Ingredients.					
II.—Ammonia Sulphate mixed group. Ration.	Sulphate of Ammonia pounds per acre.	Superphosphate pounds per acre.	Muriate of Potash pounds per acre.	Nitrogen pounds per acre.	Phosphoric Acid pounds per acre.	Potash pounds per acre.	Nitrogen per cent	Phosphoric Acid per cent.	Potash per cent.
One-twelfth	29	400	133	6	64	67	1.0	11.2	11.7
One-sixth	57	400	133	12	64	67	2.0	10.5	11.0
One-third	114	400	133	24	64	67	3.6	9.3	9.8
Two-thirds	228	400	133	48	64	67	5.8	7.6	8.0
Full........	343	400	133	72	64	67	7.3	6.5	6.8

—	Fertilizing Materials.			Ingredients.					
III.—Organic Nitrogen. mixed group. Dried blood. Ration.	Dried Blood pounds per acre.	Superphosphate pounds per acre.	Muriate of Potash pounds per acre.	Nitrogen pounds per acre.	Phosphoric Acid pounds per acre.	Potash pounds per acre.	Nitrogen per cent.	Phosphoric Acid per cent.	Potash per cent.
One-twelfth	55	400	133	6	64	67	1.5	11.2	11.7
One-sixth	110	400	133	12	64	67	2-0	10.5	11.0
One-third	220	400	133	24	64	67	3.5	9.3	9.8
Two-thirds	440	400	133	48	64	67	5.8	7.6	8.0
Full........	660	400	133	72	64	67	7.3	6.5	6.8

—	Fertilizing Materials.			Ingredients.					
IV.—"Nitrogen Mixture" mixed group. Ration.	"Nitrogen Mixture" pounds per acre.	Superphosphate pounds per acre.	Muriate of Potash pounds per acre.	Nitrogen pounds per acre.	Phosphoric Acid pounds per acre.	Potash pounds per acre.	Nitrogen per cent.	Phosphoric Acid per cent.	Potash per cent.
One-twelfth	38	400	133	6	64	67	1.5	11.2	11.7
One-sixth	75	400	133	12	64	67	2.0	10.5	11.9
One-third	150	400	133	24	64	67	3.5	8.3	9.8
Two-thirds	300	400	133	48	64	67	5.8	7.6	8.0
Full....................	450	400	133	72	64	67	7.3	6.5	6.8

This set will require twenty plots. By making the plots one-twentieth of an acre each, one acre will serve the experiment.

Another set of experiments is needed to ascertain if the action of *soluble* and *insoluble* phosphoric acid and of muriate of potash upon the growth of plants is increased by the addition of "Complete Fertilizers."

—	Fertilizing Materials.			Ingredients.					
I.—Superphosphate mixed group. Ration.	Superphosphate pounds per acre.	"Nitrogen Mixture" pounds per acre.	Muriate of Potash pounds per acre.	Phosphoric Acid pounds per acre.	Nitrogen pounds per acre.	Potash pounds per acre.	Phosphoric Acid per cent.	Nitrogen per cent.	Potash per cent.
One-sixth	100	300	133	16	48	67	3.0	9.0	12.6
One-third	200	300	133	32	48	67	5.1	7.6	10.6
Two-thirds	400	300	133	64	48	67	7.7	5.7	8.0
Full..................	600	300	133	96	48	67	9.4	4.6	6.5

—	Fertilizing Materials.			Ingredients.					
II.—Insoluble Phosphoric Acid mixed group. Ration.	Fine bone or Mineral Phosphate pounds per acre.	"Nitrogen Mixture" pounds per acre.	Muriate of Potash pounds per acre.	Phosphoric Acid pounds per acre.	Nitrogen pounds per acre.	Potash pounds per acre.	Phosphoric Acid per cent.	Nitrogen per cent.	Potash per cent.
One-sixth	67	300	133	16	48	67	3.2	9.6	13.4
One-third	103	300	133	32	48	67	5.7	8.5	11.9
Two-thirds	267	300	133	64	48	67	9.1	6.9	9.6
Full..................	400	300	133	96	48	67	11.5	5.8	8.1

—	Fertilizing Materials.			Ingredients.					
III.—Muriate of Potash mixed group. Ration.	Muriate of Potash pounds per acre.	"Nitrogen Mixture" pounds per acre.	Superphosphate pounds per acre.	Potash pounds per acre.	Nitrogen pounds per acre.	Phosphoric Acid pounds per acre.	Potash per cent.	Nitrogen per cent.	Phosphoric Acid per cent.
One-sixth	33	300	400	17	48	64	2.3	6.6	8.7
One-third	67	300	400	33	48	64	4.3	6.2	8.5
Two-thirds	133	300	400	67	48	64	8.0	5.8	7.7
Full..................	200	300	400	100	48	64	11.1	5.3	7.1

For this set of experiments with complete fertilizers, twelve plots will be needed—eight plots for the soluble and insoluble phosphoric acid, and four for the muriate of potash.

By making the plots one-twentieth of an acre each, eight plots of the acre will remain unoccupied, four of which can be left unmanured, and four treated with farm-yard manure. It will be seen, from an addition of all the plots, that four acres will be just sufficient for the entire course of experiments, embracing partial fertilizers, and complete fertilizers.

Arranged in order they would be briefly as follows :—

I.—Partial Fertilizers.

The object of which being to test the effects of ingredients separately, and the capacity of the soil to supply them.

(a) Nitrogen Set.

1. Nitrate of soda group in five rations .... 5 plots.
2. Sulphate of ammonia group in five rations .... 5 "
3. Dried blood group in five rations .... 5 "
4. "Nitrogen mixture" group in five rations .... 5 "
5. No manure .... 1 "
6. Farm-yard manure .... 1 "

(b) Phosphoric Acid Set.

7. Soluble phosphoric acid group in four rations .... 4 plots.
8. Precipitated phosphoric acid group in four rations .... 4 "
9. Insoluble phosphoric acid group—
   (*i*) Fine bone in four rations .... 4 "
   (*ii*) Mineral phosphate in four rations .... 4 "

(c) Muriate of Potash Set.

10. Muriate of potash in four rations .... 4 "
11. No manure .... 1 "
12. Farm-yard manure .... 1 "

II.—Complete Fertilizers.

"Mixed minerals" mean superphosphate and muriate of potash, each in $\frac{2}{3}$ rations

(a) Nitrogen Set.

1. Nitrate of soda with mixed minerals in five rations .... 5 plots.
2. Sulphate of ammonia with mixed minerals in five rations .... 5 "
3. Dried blood with mixed minerals in five rations .... 5 "
4. "Nitrogen mixture" with mixed minerals in five rations .... 5 "
5. No manure .... 1 "
6. Farm-yard manure .... 1 "

(b) Phosphoric Acid Set.

"Basal mixture" means "nitrogen mixture" and muriate of potash, each in $\frac{2}{3}$ ration.

7. Superphosphate with basal mixture in four rations .... 4 plots.
8. Fine bone or mineral phosphate with basal mixture in four rations .... 4 "

(c) Muriate of Potash Set.

9. Muriate of potash with $\frac{2}{3}$ ration of superphosphate and "nitrogen mixture" in four rations .... 4 plots.
10. No manure .... 1 "
11. Farm-yard manure .... 1 "

If nitrogen be taken in three groups, nitric acid, ammonia, and organic nitrogen, with three rations instead of five, $\frac{1}{3}$, $\frac{2}{3}$, and full ration, it will become possible to increase the chemical conditions of the experiment, and yet at the same time to condense the experimental plots needed to forty on an area of two acres. The increase of chemical conditions will consist in using the fertilizing materials not only separately and altogether, but two by two.

The first *acre set*, for one-twentieth acre plots, will serve nitrogen and muriate of potash; the second acre set, for one-twentieth acre plots, the phosphoric acid.

1st Acre Set—(*a*) Nitrogen Set.

No.	FERTILIZERS.	Quantities per $\frac{1}{20}$ acre plots.
	I.—Preliminary Group.	Pounds.
1.	Nitrate of soda, two-third ration	15.0
2.	Superphosphate " "	20.0
3.	Muriate of potash " "	6.7
4.	Nitrate of soda " "	15.0
	Superphosphate " "	20.0
5.	Nitrate of soda " "	15.0
	Muriate of potash " "	6.7
6.	Superphosphate } Mixed minerals	20.0
	Muriate of potash }	6.7
	II.—Nitrate of Soda Group.	
7.	Mixed minerals as No. 6	26.7
	Nitrate of soda, one-third ration	7.5
8.	Mixed minerals as No. 6	26.7
	Nitrate of soda, two-thirds ration	15.0
9.	Mixed minerals as No. 6	26.7
	Nitrate of soda, full ration	22.5
	III.—Sulphate of Ammonia Group.	
10.	Mixed minerals No. 6	26.7
	Sulphate of ammonia, one-third ration	5.6
11.	Mixed minerals as No. 6	26.7
	Sulphate of ammonia, two-thirds ration	11.3
12.	Mixed minerals as No. 6	26.7
	Sulphate of ammonia, full ration	16.8
	IV.—Dried Blood Group.	
13.	Mixed minerals as No. 6	26.7
	Dried blood, one-third ration	11.0
14.	Mixed minerals as No. 6	26.7
	Dried blood, two-thirds ration	22.0
15.	Mixed minerals as No. 6	26.7
	Dried blood, full ration	33.0
	(*b*) *Muriate of Potash Set.*	
16.	Mixed minerals as No. 6	26.7
	Muriate of potash, one-third ration	3.4
17.	Mixed minerals as No. 6	26.7
	Muriate of potash, two-thirds ration	6.7
18.	Mixed minerals as No. 6	26.7
	Muriate of potash, full ration	10.0
19.	No manure	....
20.	Farm-yard manure	....

2ND ACRE SET—(*a*) PHOSPHORIC ACID SET.

No.	FERTILIZERS.	Quantities per $\frac{1}{20}$ acre plots.
		Pounds.
	I.—*Preliminary Group.*	
1.	"Nitrogen mixture," two-thirds ration	15.0
2.	Superphosphate " "	20.0
3.	Muriate of potash " "	6·7
4.	Nitrogen mixture	15.0
	Superphosphate	20.0
5.	Muriate of potash	6.7
	Superphosphate	20.0
6.	Nitrogen mixture } Basal mixture	15.0
	Muriate of potash }	6.7
	II.—*Soluble Phosphoric Acid Group.*	
7.	Basal mixture	21.7
	Dissolved bone black, one-third ration	10.0
8.	Basal mixture	21 7
	Dissolved bone black, two-thirds ration	20.0
9.	Basal mixture	21.7
	Dissolved bone black, full ration	30.0
	III.—*Precipitated Phosphoric Acid Group.*	
10.	Basal mixture	21.7
	Precipitated phosphate, one-third ration	10.0
11.	Basal mixture	21.0
	Precipitated phosphate, two-thirds ration	20.0
12.	Basal mixture	21.7
	Precipitated phosphate, full ration	30.0
	IV.—*Insoluble Phosphoric Acid Group, in form of fine bone or finely powdered Mineral Phosphate.*	
13.	Basal mixture	21.7
	Bone dust or mineral phosphate, one-third ration	10.0
14.	Basal mixture	21.7
	Bone dust or mineral phosphate, two-thirds ration	20.0
15.	Basal mixture	21.7
	Bone dust or mineral phosphate, full ration	30.0
	(*b*) *Sulphate of Lime Group.*	
16.	Basal mixture	21.7
	Sulphate of lime, one-third ration	3.8
17.	Basal mixture	21.7
	Sulphate of lime, two-thirds ration	7.5
18.	Basal mixture	21.7
	Sulphate of lime, full ration	11.3
19.	No manure	....
20.	Farm-yard manure	....

In this condensed form of Prof. Atwater's scheme of coöperative experimenting, nitrogen, phosphoric acid, and potash are used separately in two-thirds rations upon six plots, two plots each. They are then combined two by two in two-thirds rations, and, lastly, two-thirds of two of them are added in turn to one-third, two-thirds, and full rations of the other. The sulphate of lime group has been suggested in order to ascertain if the effect of the superphosphate be due in part to the sulphate of lime always present in it. This system of fertilizing makes it possible for an experimenter accurately to determine the effect of the fertilizers separately, and, accordingly, the capacity of the soil to supply them, and, also, the increased effect given to one by the addition of the others. Our ordinary crops—wheat, barley, rye, oats, grass, clover, onions, potatoes, turnips, etc.—should be tried by the same system of experimenting, in order that the feeding capacities of each, both as regards the natural supply of plant food and the artificial, may become clearly manifest.

Very respectfully,

R. B. Hare,

Prof. Chemistry, O. A. C.

THE LIVE STOCK EXPERIMENTS OF 1882.

We are still prosecuting the enquiry of what kinds of grain give most rapid and cheapest results in the fattening of cattle under three years old—knowing that it is only by a multiplication of experiments that reliable information can be gathered for the guidance of the average farmer. Since the issue of our last Advance Report on this subject a very wide and keen interest has been evolved throughout the Dominion, with commendatory notices from England, the United States, and elsewhere, so that we are not yet allowed to call "enough."

In addition to beef production, the newer, and probably less understood, subject of what mutton and wool are best for the great markets of the world has been receiving our further attention, and in this regard I have pleasure in submitting a most important addition to scientific observations from the pen of Professor McMurrich, of this College, whose position as a careful and practical manipulator is already well known in the United States and Canada. It is somewhat remarkable that since Youatt's discovery of the serrations on wool, hardly anything has been added for the guidance of manufacturers, and as wool is a crop that changes materially under conditions of soil, climate, and management, it is our duty to make examinations in this direction, especially in view of the increasing importance of sheep husbandry.

I have been so often asked for copies of my letter to you in 1878, entitled "Canadian Beef for Britain," that I submit a revised copy of it under a new name.

I.—CORN IN CATTLE FATTENING.

First Experiment.

From 12th April to 25th June, 1881, three three-year-old steers were fed upon hay, bran, roots, and corn. Quantities of food and increase of growth in this and all other cases refer to the *average per head.*

Food consumed by one animal during seventy-five days:—

	lbs.
Roots	4125
Bran	50
Hay and green fodder	1022
Corn	657

Result in increased weight :—

	lbs.
Weight of animal on entry	1163
Weight at finish	1271
Increase	108
Daily increase	1·44

Second Experiment.

From 1st November to 25th December, 1881, three yearling steers received the following average per head :—

Food consumed during fifty-six days :—

	lbs.
Roots	2280
Bran	100
Hay	715
Corn	414

Result in increased weight :—

	lbs.
Weight of animal on entry	907
Weight at finish	1040
Increase	133
Daily increase	2·37

Third Experiment.

From 26th December, 1881, to 19th February, 1882, three steers, changing from yearlings to two-year-olds, received the following average per head :

Food consumed during fifty-six days :—

	lbs.
Roots	2118
Bran	118
Hay	736
Corn	566

Result in increased weight :—

	lbs.
Weight of animal on entry	1098
Weight at finish	1208
Increase	110
Daily increase	1·96

Fourth Experiment.

From the 20th February to 16th April, 1882, three two-year-old steers consumed per head, on an average, as follows :

Food consumed during fifty-six days :—

	lbs.
Roots	1220
Bran	120
Hay	618
Corn	606

Result in increased weight :—

	lbs.
Weight of animal on entry	1100
Weight at finish	1205
Increase	105
Daily increase	1·87

ABSTRACT OF EXPERIMENTS WITH CORN.

Food consumed by one animal during 243 days :—

	lbs.
Roots	9743
Bran	388
Hay	3091
Corn	2243

Result in increased weight during average of sixty-one days :—

	lbs.
Average weight of animal on entry	1067
" " " at finish	1181
" increase	114
Daily increase	1.91

II.—PEAS IN CATTLE FATTENING.

First Experiment.

From 12th April to 25th June, 1881, three three-year-old steers were fed on peas as a test grain.

Food consumed by one animal in seventy-five days :—

	lbs.
Roots	4125
Bran	50
Hay	1022
Peas	657

Result in increased weight :—

	lbs.
Weight of animal at entry	1243
Weight at finish	1388
Increase	145
Daily increase	1.94

Second Experiment.

From 1st November to 25th December, 1881, three yearling steers received the following average per head :—

Food consumed during fifty-six days :—

	lbs.
Roots	2370
Bran	106
Hay	755
Peas	463

Result in increased weight :—

	lbs.
Weight of animal on entry	958
Weight at finish	1098
Increase	140
Daily increase	2.50

Third Experiment.

From 26th December, 1881, to 19th February, 1882, three steers, changing from yearlings to two-year-olds, received the following average per head :

Food consumed during fifty-six days :—

	lbs.
Roots	1674
Bran	115
Hay	633
Peas	551

Result in increased weight :—

	lbs.
Weight of animal on entry	1010
Weight at finish	1100
Increase	90
Daily increase	1.61

Fourth Experiment.

From 20th February to 16th April, 1882, three two-year-old steers consumed per head on an average as follows :

Food consumed during fifty-six days :—

	lbs.
Roots	1211
Bran	129
Hay	654
Pease	626

Result in increased weight :—

	lbs.
Weight of animal on entry	1097
Weight at finish	1169
Increase	72
Daily increase	1.27

ABSTRACT OF EXPERIMENTS WITH PEAS.

Food consumed by one animal during 243 days :—

	lbs.
Roots	9380
Bran	400
Hay	3064
Peas	2297

Result in increased weight during average of sixty-one days :—

	lbs.
Average weight of animal on entry	1077
" " " at finish	1189
Average increase	112
Daily increase	1.83

III.—OATS IN CATTLE FATTENING.

First Experiment.

From 12th April to 25th June, 1881, three three-year-old steers were fed on oats.

Food consumed by one animal in seventy-five days :—

	lbs.
Roots	4125
Bran	50
Hay	1022
Oats	657

Result in increased weight :—

	lbs.
Weight of animal on entry	1301
Weight at finish	1411
Increase	110
Daily increase	1.47

Second Experiment.

From 1st November to 25th December, 1881, three yearling steers received the following average per head :

Food consumed during fifty-six days :—	lbs.
Roots	2290
Bran	101
Hay	618
Oats	447

Result in increased weight :—	lbs.
Weight of animal on entry	888
Weight at finish	1009
Increase	121
Daily increase	2.16

Third Experiment.

From 26th December, 1881, to 19th February, 1882, three steers, changing from yearlings to two-year-olds, received the following average per head :

Food consumed during fifty-six days :—	lbs.
Roots	2036
Bran	114
Hay	698
Oats	508

Result in increased weight :—	lbs.
Weight of animal on entry	1040
Weight at finish	1121
Increase	81
Daily increase	1.44

Fourth Experiment.

From 20th February to 16th April, 1882, three two-year-old steers consumed per head on an average as follows :

Food consumed during fifty-six days :—	lbs.
Roots	1469
Bran	126
Hay	682
Oats	655

Result in increased weight :—	lbs.
Weight of animal on entry	1208
Weight at finish	1288
Increase	80
Daily increase	1.43

ABSTRACT OF EXPERIMENT WITH OATS.

Food consumed by one animal during 243 days :—

	lbs.
Roots	9833
Bran	391
Hay	3020
Oats	2267

Result in increased weight during average of sixty-one days :—

	lbs.
Average weight of animal on entry	1109
" " " at finish	1207
Average increase	98
Average daily increase	1.60

IV.—COMPARATIVE RESULTS WITH CORN, PEAS AND OATS, IN CATTLE FATTENING.

Twelve different experiments, exchanged with three different sets of animals, carefully conducted in every respect as regards equal conditions of management, weighings, uniform selection of animals, and weather influences, should give some clear indications of what certain foods are capable of doing in the production of young beef. This is no case of leaving anything undone; no guessing, no irregularity in anything, but an uniform and systematic production of facts in every respect.

The sum and substance of the whole series is thus briefly stated :—

	lbs.
Corn has given a daily increase per head of	1.91
Peas " " "	1.83
Oats " " "	1.60

As will be observed, the quantities of food consumed were practically alike in each case, so that the only remaining question is price of *grain.* This varies much every season, and may, therefore, be left to those interested, with the note that, at the proper time of the year, corn, peas and oats can be had and laid past in quantity, at *one cent per pound* each, namely : 56 cents per bushel for corn, 60 for pease, and 34 for oats. Taking this view, which of them has produced the cheapest beef ?

Corn—2243 lbs.	gave 464 lbs.	increase at a cost of	$4\frac{8}{10}$ c. per lb.
Peas— 2297	" 445	" "	$5\frac{2}{10}$ c. "
Oats— 2267	" 389	" "	$5\frac{8}{10}$ c. "

Or, in finishing an average steer from 1st October to 1st June, the cost for grain would be :—

By corn	$20 75
By peas	22 50
By oats	25 10

Which with 1000 head of cattle is,—

Corn	$2075
Pease	2250
Oats	2500

Comment is unnecessary, though the end is not yet.

V.—OILCAKE IN CATTLE FATTENING.

After the feeding experiments just recorded, we set aside two batches, of three head each, of the same cattle, for the purpose of ascertaining whether *one-half* the quantity of grain in the form of Linseed cake (usually called "Oilcake") as one of our high class foods, or Cottonseed cake, as another, would, alone and separately, uphold the animal system as effectually as the mean of corn, peas, and oats had done. In order to eliminate all interference by other stuffs and yet give life a fair chance, neither bran, roots, nor any other food whatever, except hay, was allowed. At the same time, in order not to make the change too rapid, we gave one week on reduced corn, oats, and peas, previous to beginning this experiment.

The experiment began on the 4th May, and ended 7th June—making 34 days, each batch of cattle being changed at half time from Oilcake to Cottonseed, and from Cottonseed to Oilcake, so that we are really handling four in place of two experiments.

Food consumed per head :—

Hay, 618 lbs., or 18 lbs. per day.
Cake, 151 " $4\frac{1}{2}$ "

Result :—

	lbs.
Average weight per head on entry	1161
" " at finish	1184
Increase	23
Daily increase	$\frac{2}{3}$

VI.—COTTONSEED CAKE IN CATTLE FATTENING.

This was conducted under precisely similar circumstances as the Oilcake, and with the same object in view, so that all required here is to record quantities of hay and cake consumed, and state results.

Food consumed per head :—

Hay, 595 lbs., or 17 lbs. per day.
Cake, 160 " $4\frac{7}{10}$ "

Result :—

	lbs.
Average weight per head on entry	1175
" " at finish	1173
Decrease for the period	2

VII.—COMPARATIVE RESULTS IN FATTENING CATTLE WITH OILCAKE AND COTTONSEED CAKE.

The diary of these does not show anything as having occurred to interfere with regularity of progress. At first the animals did not eat the Cottonseed cake so freely, and they drank considerably more water than those upon Oilcake.

In criticizing the results, attention is first directed to quantities of food consumed, as to which it appears that the slightly lighter stamp of animals eat one pound less hay and one-half pound less cake per day than those upon Cottonseed cake. Much stress cannot be placed on this, other than to remember that the least food with the lighter animals gave the best results, which, so far as we are able to judge, must be attributed to influence of *kind of food.*

Practically, Linseed cake gave a daily increase of two-thirds of a pound, and Cottonseed cake just held its ground and no more; that is, it made no increase, nor did it allow the animals to fall off during thirty-four days.

The best lesson in these facts is, in my opinion, that these cakes have been able to maintain the animals so long, especially following the very liberal supply of corn, peas, oats, bran, roots, and hay. The two forms of feeding stand thus financially :

Daily consumption per head :—

	lbs.		lbs.
Hay	10	Hay	$17\frac{1}{2}$
Roots	40	Cake	$4\frac{1}{2}$
Bran	$2\frac{1}{2}$		
Corn, peas, oats	11		
	$63\frac{1}{2}$		22
Cost 24 cents.		Cost 16 cents.	

Result :—

	lbs.	
Increase of	$1\frac{3}{4}$	No increase, nor loss.

So it is something to say that twenty-two pounds of two things gave no increase at a cost of sixteen cents, and that sixty-three and a half pounds of six things gave one and three-quarter pounds increase at a cost of twenty-four cents, or thirteen and a half cents per pound. This does not by any means show so much against cake and hay, because the chemist may step in and say that, according to nutritive value, they have done as much, and may-be more, than the others.

I respectfully submit these to the opinion of Sir J. B. Lawes, of Rothamstead, England.

VIII.—THE MICROSCOPIC EXAMINATION OF TWELVE KINDS OF WOOL GROWN ON THE ONTARIO EXPERIMENTAL FARM.

I think it is safe to say that, excepting where undertaken as a specialty on the large scale, the growth of wool is yet very much a matter of subordinate importance in conneetion with the mixed farming of any country. Superior and extensive cultivation of crops under rotation has not recognized with its mutton production what the wool should bc, except as one of so many pounds per head. The best farmer of such conditions is generally a breeder of thoroughbred cattle and some sheep; the medium farmer a fattener of cattle and some sheep, and the third-rate farmer a miserable imitator of both. As the home of the thoroughbred, therefore, mixed husbandry has necessarily been indifferent to wool other than demanded by particular standards of breeds—per the ram especially. The question of producing the largest quantity of a certain kind of wool for a particular market has not troubled the arable area to any extent anywhere. But why should this be so? If it is not just as much a thing of value *per acre* as any other crop, then it is not worth growing. When any farmer is not a breeder of thoroughbreds, there cannot possibly exist any reason for inattention to wool to suit the ruling market of the time, subject of course to conditions appropriate to the best results. Canada is just beginning to realize this part of her duty; and, in view of the great field thus opening, I think it well that our work here should show the nature of the product so far as it lies outside the reach of ordinary hands. I refer to the structure of wool as exhibited under the microscope. I know of no publication, scientific or otherwise, that does this with the leading breeds of sheep and their crosses, as bred and matured under *precisely similar conditions*. It is well known that the character of wool is materially affected by climate, soil, and management; and consequently, while we have access to some facts applicable to a particular breed in a particular part of the world, they cannot serve as a guide for a provincial purpose so much as when the facts are being gathered, as in our special circumstances. Then, again, it is not alone the knowledge of the pure breeds that is thus required; it is just as essential, if not more so, that the grower of wool be conversant with the powers of the thoroughbreds over the commoners of their kinds, for through such a source alone can we look for cheapness of produce. It is no boast that this farm is well up in breeds of sheep, and that particular attention has been paid to the question of mutton and wool for the markets of the world.

Without further introduction, I have now pleasure in submitting the following letter from Professor McMurrich, our skilled Microscopist, upon which I propose to make some remarks from a practical farmer's standpoint :—

"ONTARIO AGRICULTURAL COLLEGE,

"May 31st, 1881.

"PROFESSOR BROWN:

"DEAR SIR,—Having lately been engaged, at your request, in making a microscopical examination of a number of specimens of wool taken from sheep of various breeds, with a view to ascertaining the diameter and number of imbrications to the inch in each breed, I desire now to present to you a report of my observations.

"I was furnished with specimens of wool from a Southdown, Southdown Grade, Leicester, Leicester Grade, Oxford Down, Oxford Down Grade, Canadian, Shropshire Down, Shropshire Down Grade, Merino, and Merino Grade. Of the Shropshire Down, Southdown, Southdown Grade, and Oxford Down wools I was given specimens from two individuals; of the wools of other varieties I was obliged to content myself with a specimen from a single sheep.

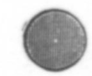
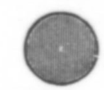
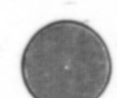
"My method of investigation was as follows:—Having made a temporary microcopical preparation of a wool, I examined it with a Zeiss objective D. and ocular 4, giving a magnifying power of 440 diameters. With this power I was enabled readily to measure all the various specimens, and also to distinguish the imbrications with comparative facility. In one or two instances it was necessary to submit the wool to a cleansing process, to remove the fatty matter from the fibres before the imbrications could be distinctly seen. In fact, in both the specimens of Southdown wool I examined, the imbrications were completely hidden from view by the fatty secretion; the Merino specimen being, on the other hand, singularly free from it. I believe that none of the specimens I obtained had been previously washed. In order to remove this fat I had recourse to ether, which quickly dissolves it, leaving the fibres clean, white, and in splendid condition for observation.

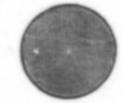
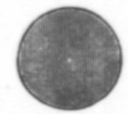
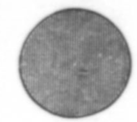
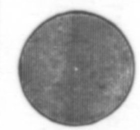
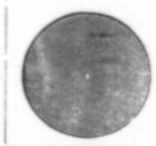
"In order, as far as possible, to secure accuracy, I made fifteen measurements both of the diameter and number of imbrications in each specimen of wool, taking the average as being approximately correct. The scale with which I made the measurements was an ocular micrometer, each division of which corresponded to .00385 millimetres, and there being fifty of these divisions, the whole scale had the value .1925 m.m.; this expanded into inches gives one division equal to $\frac{3}{20000}$ of an inch, and the whole scale equivalent to $\frac{379}{50000}$. The number of divisions of the scale which the fibre appeared to cover, multiplied by $\frac{3}{20000}$, gave, of course, the diameter of the fibre in the fractions of an inch; the imbrications I calculated, by counting the number found, in the length of the scale, *i.e.*, in $\frac{379}{50000}$ of an inch, and from that calculating the number to the full inch. Of course, owing to the fibres being so highly magnified, a very slight variation in the number of the imbrications of two of them, as observed by the microscope, would cause an apparently very large difference in the number when calculated out to the inch. This fact is to be borne in mind when examining the appended table, for, as will be seen, there is an apparently very large difference between the diameter of the largest hairs and that of the smallest in any breed. Take, for example, the Southdown: in it the largest fibre measured was $\frac{1}{606}$ of an inch, and the smallest $\frac{1}{1333}$; the diameter of the former is more than twice the size of the latter, and yet they are both so very small that the great difference in size is comparatively trifling. In some instances—as for example, the Shropshire Down Grade—there seem to be two well-marked sizes of hairs, one measuring from $\frac{1}{784}$ to $\frac{1}{833}$ of an inch, and the other from $\frac{1}{606}$ to $\frac{1}{666}$ of an inch. Another point to be noted is, that even in different points on the same hair the measurement differs, as, for example, a hair from a Cotswold measured at one place $\frac{1}{333}$, and at another $\frac{1}{400}$ of an inch.

"In the following Table I have given the diameter in inches of the largest and smallest fibre observed, and also the average diameter; and similarly, the smallest and greatest number of imbrications in the inch, and the average number. To readily allow comparison of the diameters of the wool of the various breeds, I have given a number of circles, drawn to scale, representing the relative size of the individual hairs in the wool of each breed:—

TABLE.

SHOWING the Average Diameter and Number of Imbrications to the Inch in the Wools of various Breeds of Sheep, as bred and managed at the Ontario Experimental Farm.

No.	NAME.	DIAMETER.	IMBRICATIONS.	Relative Size.
1	Merino	$\frac{1}{833}-\frac{1}{1333}$; average, $\frac{1}{999}$	1846—2638 ; average, 2303	
2	Southdown	$\frac{1}{808}-\frac{1}{1333}$; average, $\frac{1}{982}$	1847—2111 ; average, 1961	
3	Southdown Grade	$\frac{1}{808}-\frac{1}{952}$; average, $\frac{1}{826}$	1589—1846 ; average, 1715	
4	Merino Grade	$\frac{1}{808}-\frac{1}{952}$; average, $\frac{1}{723}$	1583—1962 ; average, 1860	
5	Leicester	$\frac{1}{555}-\frac{1}{1111}$; average, $\frac{1}{717}$	1055—1589 ; average, 1283	
6	Shropshire Down Grade	$\frac{1}{579}-\frac{1}{889}$; average, $\frac{1}{689}$	1187—1589 ; average, 1372	
7	Shropshire Down	$\frac{1}{555}-\frac{1}{889}$; average, $\frac{1}{680}$	1187—1715 ; average, 1504	
8	Oxford Down Grade	$\frac{1}{512}-\frac{1}{883}$; average, $\frac{1}{611}$	1187—1847 ; average, 1511	

8	Oxford Down Grade	$\frac{1}{512}$ – $\frac{1}{883}$; average, $\frac{1}{611}$	1187—1847 ; average, 1511	
9	Canadian	$\frac{1}{535}$ – $\frac{1}{741}$; average, $\frac{1}{611}$	1187—1715 ; average, 1425	
10	Leicester Grade	$\frac{1}{535}$ – $\frac{1}{741}$; average, $\frac{1}{554}$	1319– 1715 ; average, 1513	
11	Oxford Down	$\frac{1}{392}$ – $\frac{1}{833}$; average, $\frac{1}{517}$	1187—1715 ; average, 1511	
12	Cotswold	$\frac{1}{334}$ – $\frac{1}{687}$; average, $\frac{1}{487}$	791—1319 ; average, 1117	

Grade here is the result of the pure bred ram, respectively, with an ordinary Canadian ewe (9), which is therefore the *female* source of all these grades.

"From this table it will be at once seen that the Merino stands preëminently first, both as regards the fineness of the wool and the felting qualities, as indicated by the number of imbrications. Following it, and far ahead of the third in the order of merit, stands the Southdown; and succeeding it come Southdown Grade and Merino Grade, both about equal; for though the former surpasses the latter in fineness, yet the Merino Grade is about as far ahead of the South Down Grade in the number of imbrications. The fineness of the wool is, however, of greater importance than the number of imbrications, and on that account I have placed the Southdown Grade before the Merino Grade.

"The three following varieties—viz., Leicester, Shropshire Down Grade, and Shropshire Down—are about on a par for the same reason, the latter two being imbricated much more finely than the first, and the Shropshire Down very much more finely than either of the other two, in addition to which the imbrications are more distinct, indications which would denote better felting qualities. I have placed the Shropshire Down last of the three only on account of its greater diameter, it being really, as far as the microscopical appearance goes, a better wool.

"The Oxford Down Grade and the Canadian breed are about on a par, as are also the Leceister Grade and the Oxford Down, any advantage being on the side of the former, while the Cotswold, both in diameter and in the number of imbrications, falls far below both.

"I have no more to add, except to point out the unsatisfactory nature of a single examination. To be of any great value, the observations would require to be extended over a number of years, and made in different parts of Canada, in order that the influences of climate, fodder, etc., might be justly appreciated.

"I remain,

"Yours respectfully,

"J. PLAYFAIR MCMURRICH,

"*Professor of Biology and Horticulture,*

"*Ontario Agricultural College.*

"TO PROF. BROWN,

"*Agricultural College, Guelph.*"

Wool, then, is no simple hair, with little variety, among breeds, but a beautifully scaly-toothed plant, differing in size and form, according to soil, climate and management—management implying food, and mode of treatment. The twelve distinct wools of this farm offer a rare field of enquiry.

As a practical farmer, I want to know which of these wools is best for certain manufactures? Does there exist any reason why the manufacturer should not order from me, and others, the kind of wool he wants, and which he can describe as requiring—

1.—A certain length;

2.—A certain strength, or breaking power;

3.—A certain diameter;

4.—Having so many spirals, or curls, per inch;

5.—So many teeth, or imbrications, per inch?

The regulation of these, to a large extent, is in the hands of the grower, and so long as the manufacturer makes no complaint, so long is the former likely to remain indifferent. How many of my profession know, or care, that, while to the naked eye and easily handled as a subject of rustic examination, the wool of the Merino is nevertheless so fine that it requires one thousand (999) of them, side by side, to cover one inch, and that one inch of its length shows actually 2,300 teeth? If there be value in these things, then what is the difference to the manufacturer when, with the Cotswold, we can give but 487 fibres and 1.117 serrations per inch? Between these extremes in Professor McMurrich's table there lies an interesting study—even still very little understood by the manufacturers themselves.

It will be satisfactory to Leicester men to find their favourite so high in fineness of fibre, beating even the Oxford and Shropshire Downs with their grades; at the same time, this typical sheep is second lowest in serrations, only 1,283 per inch. In our ignorance we ask how it is that some breeds seem to have more power than others in regulating the character of the fleece? Try the following comparative Table for this check :—

View of the Impressive Power of Pure Bred Rams in Regard to Wool.

Breed.	1. Possessing.		2. And Put to.		3. Give.		4. Compare with Mean of Male and Female.		Greater Influence by
	Diameter.	Teeth.	Diameter.	Teeth.	Diameter.	Teeth.	Diameter.	Teeth	
Merino	999	2303	611	1425	725	1860	805	1864	Male.
Southdown	982	1961	"	"	826	1715	796	1693	Male.
Leicester	717	1283	"	"	554	1513	664	1354	Female.
Shropshire Down..	660	1504	"	"	669	1372	635	1464	Equal.
Oxford Down	517	1511	"	"	611	1511	564	1468	Equal.
Mean	777	1712	611	1425	677	1594	693	1568	....

There may not be much in this table, and yet it is a line of enquiry that should not be overlooked. It is the belief of breeders that the male has the greater influence in most things, even to the fleece; this is probably correct so far as regards length and spirals, or otherwise, as can be judged by the naked eye, but may not be as to the minuter construction of the fibre. In order to be able to make an easy comparison with actual results, as shown in column 3, the fourth column is the mean of columns 1 and 2. No doubt the farther the male is removed from the common Canadian ewe, such as the Merino and Southdown, the greater we would expect the sire's influence to be; and the nearer, as in the Leicester, the less that influence; while, on the other hand, the two medium wools, Shropshire and Oxford Downs, would be expected to balance matters. These are the facts exactly, according to this our first scientific wool examination.

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IX.—FAT SHEARLING WETHERS.

As usual, the breeding of these with us has been the first cross of the pure bred rams and a common Canadian ewe, with the one exception named; they were dropped, on an average, on the 10th March, 1881, and weighed for this record on 1st June, 1882, say 445 days. First, as to weights :—

LIVE WEIGHT OF FAT SHEARLING WETHERS—(SHORN).

——	AVERAGE WEIGHT OF TOPS.	AVERAGE WEIGHT OF CULLS.	MEAN.	DAILY RATE PER HEAD.
	lbs.	lbs.	lbs.	lbs.
Leicester, *High Graded*	242	....	242	.54
Leicester Grades	189	....	189	.40
Oxford Down Grades	186	147	167	.37
Shropshire Down Grades	185	148	167	.37
Southdown Grades	165	133	149	.33
Merino Grades	138	....	138	.31
Mean	184	....	175	.39

I should like to say a good deal in regard to the Provincial importance of this subject of weight of shearling mutton, but cannot lengthen much in such a form as this. It is obvious, first of all, that our best men are now settling down to the work of feeding young mutton of sufficient weight to make it pay. It is as true in this as in beef growing, that the sooner we get rid of every head we can spare the better, so long as a *paying weight* is reached. The regulation of weight lies with the consumers, and Britain, as our best market, wants, as is well known, just about 160 pounds alive. That this can be attained with lambs of the previous year is evident from our previous reports, and now again corroborated by these figures. The high graded Leicesters in the Table are the only wethers not of our own breeding, having been got from William Whitelaw, Esq., of Guelph, and fed by us in order to show to what "blood" and kind can be *pressed.* The heaviest of the lot made 272 pounds—a daily average of no less than .60 (nearly two thirds of a pound)—a most unusual result in sheep life. But the ordinary grade of the Leicester is size enough for any wants, and coarse enough to exclude it, along with the Cotswold, from the table of even the middle classes. At the same time it is but fair to admit that, taken when a shearling, Leicester mutton is not nearly so patchy and unpresentable as when older. Next to the Leicester in weight is the Oxford Down Grade, which in our six years' experience has always given over 180 pounds per head, and a daily rate of one-third of a pound. The Shropshire Down Grade has twice surprised us in its early maturing—equalling the Oxford. Its build does not convey this in estimating by the eye, as the comparatively narrow forequarters impress a lightness that does not exist; as with polled cattle, they weigh like lead. Compare with these the grade of the South Down—a record of 149 pounds per head on an average, and 165 by tops. We cannot speak from experience regarding the flesh quality of the Merino Grade; Europe calls it woody and in want of marble, though the United States gives a more favourable report. The weight with us is certainly handsome, according to kind, but it must be noted that the ram is of the French stamp, a pure and recently imported Rambоulia, weighing now 240 pounds.

X.—SOME FACTS TO GUIDE THE GROWER OF BEEF.

Any branch of science that is intimately related to the more prominent necessaries of human life must be the most interesting of all sciences. The beauties of study in Astronomy and Geology cannot, for example, compare in intrinsic value with Animal Physiology and Chemistry as taught through the upbuilding of a fattening steer and of a bushel of wheat; yet the discoverer of a planet or of a new compound secures the world's applause, as against the producer of improved food for man. That this will always be so is not evident, because, I think, as the world becomes more practical, it will also become more honest in distribution of favours that bear upon the every-day comforts of its people. Excuse the temptation thus given to record in our history, as Experimentalists, how much we rejoice with Europe in the high honour just accorded to the late J. B. Lawes—now Sir J. B. Lawes, Bart., of Rothamstead, England—England's first man in the science and practice of what has largely made her a nation—Agriculture.

It is already a certain thing that the leaders of all classes are becoming more practical in regard to the life of the millions of every country; in fact, land and its productions are not only the absorbing questions, but are at the root of a revolution that will ring the earth in another ten years. In calling the attention of Ontario farmers to this phase of rural economy, I do so with the view of obtaining for that branch of it called "Live Stock" such a measure of scientific recognition as its importance justifies. I do not complain that science has taken no notice of beef, mutton and wool, in other countries, but I do complain that the great national bodies of scientific men on this continent have not formally admitted farmers as co-partners in their annual deliberations. I shall apologize if I am in the wrong in this, as I may have overlooked some recent work; but I cannot withhold complaint, if, on the other hand, no place, for example, has been, or will be, allowed the scientific and practical agriculturist, nor any encouragement given, in the prosecution of his studies, at the forthcoming meetings of the American and British Associations for the Advancement of Science, at Montreal.

The enterprising farmer of these days is not satisfied with a knowledge of the principles of the sciences that are intimately related to his profession—the practical application of some of which he can even venture upon himself—but he requires that the pure scientist guide him through all the daily and yearly history of every field and animal of his farm, in order to the greatest amount of the most valuable produce, in the shortest time, at the least cost.

The Purpose of Cattle Fattening—

1. Is to obtain the largest quantity of the best quality of beef, at the least cost, under three years of age.
2. To aim at breeding, raising, and fattening one cattle beast from every ten cultivated acres of the Province.
3. To grow all the food required for these purposes within ourselves.
4. The animals to weigh alive not less than 1,500 pounds each.
5. The net cost of production, giving credit for manure, not to exceed five cents per pound, live weight.
6. To obtain one ton of manure per month, from each cattle beast over two years old, when stabled to finish the fattening process.
7. The value of such manure, under the best management, to be made worth $2.50 per ton.

The Animal in Cattle Fattening.

In any class it is desirable to have—

8. Purity of sire;
9. A certain age and sex;
10. A quiet disposition;
11. Quality, as indicated by fine head and ears, fine bone, horn, tail, and a medium thick skin, having plenty of fine, soft silky hair, with mellowness;
12. A weight-carrying frame;
13. Such a breed as will mature, or premature, from two to three years of age;
14. Having the character of doing best upon Ontario pastures;
15. Giving the best quality of flesh, with least offal;
16. Sure breeders and good nurses;

17. The Shorthorn Grade is best for weight, early maturity and stall feeding;
18. The Hereford Grade is best for hardiness, and grazing disposition;
19. The Aberdeen Poll Grade is best for an even average of all requirements;
20. The Galloway Grade is best for extreme hardiness and quality of flesh;
21. The Devon Grade is best for good nursing and sure breeding.

The Food of Fattening Cattle.

Its use is to—

22. Keep up animal heat, or life;
23. Repair the waste;
24. Increase growth;
25. Produce flesh and fat.

Its value is affected by—

26. The particular breed;
27. Age of the animal;
28. Individual character;
29. Conditions of life—such as temperature;
30. Management.

31. In growing our own cattle food, the first question should be:—How much beef can we get per acre? the second, How much manure are we able to return?

32. The amount of increase that may be calculated upon as the produce of certain quantities and kinds of food, depends upon paragraphs 8 to 30.

33. Chemically, we can calculate upon getting one pound of flesh from any food that has *ten parts of dry substances* in its composition:—thus, 100 pounds of Swede turnips, having as much as ninety parts of water, will only give the pound of flesh, while 100 pounds of corn, having only thirteen parts of water, will give ten pounds of flesh.

34. Practically, foods give results according to their chemical analysis, when combined, or mixed, to suit the particular animal system.

35. For example, a mixture of corn, peas and oats, will give better results than corn alone, although seven per cent. lower in nutritive properties.

36. Never forget the difference between "life" food and "fattening" food; starch and sugar keep up heat and life, and unless they are supplied, along with fats and oils, the fattening process will be slower, because heat and life would have to be supplied from the fats and oils; if given in excess, starch and sugar will produce fat on animals.

37. A young animal, building its bone and muscle, requires different kinds and quantities of food from the more mature one. Hay, straw, and other fodders are best for the immature animal; they are also heat and fat makers, and would fatten alone, though slowly.

38. Rapid growth and much fat are opposed to each other; so, to grow carcass and also fatten early, requires bone-forming and fat-forming materials—they must go together.

39. A maturing animal—cattle two to three years old—having built the most of its frame, requires less fodders, and more flesh and fat formers. Grain in many forms is therefore best for finishing fattening cattle.

40. From birth to the time a cattle beast is ripe, the daily rate of increase on an average should be not less than one and one-half pound,—thus, a three-year-old should weigh 1,600 pounds; and two and one half-year old, 1,360; and a two-year-old, 1,100 pounds alive.

41. But, in fact, the daily rate of increase is more up to two years, than at any time afterwards. A two-year-old, well done to, will weigh 1,400, and if carried on to three years, will not scale less than 1,800 pounds. This may be called *pre-maturing*.

42. Very much then of the success of obtaining big weights in a short time, lies in a knowledge of individual character, and the proper proportions and kinds of food.

43. The best kind of permanent pasture—a mixture of certain grasses and clovers—under favourable conditions, will give a greater daily increase than any other form of food.

44. A two-year-old cattle beast put to such pasture on 15th May, when it weighs 1,100 pounds, will stand 1,400 on 1st October following. The addition of grain under such circumstances does not add correspondingly to weight, though it does so on comparatively poor pasture.

45. Proper shelter and water on pasture means forty per cent. of the increase.

46. When no first-class permanent pasture is kept, it is desirable to provide for short commons by having a regular supply of green fodders; feed these either upon the fields or by "soiling."

47. Soiling fattening cattle in Ontario implies the production of one animal per acre, in place of three acres of ordinary pasture maintaining one; the principal soiling crops are corn, lucerne, red clover, tares and oats, rye and rape.

48. When it is desired to prepare for exhibitions, or for extra condition at Christmas, soiling, in a loose box all summer, in addition to grain, cannot be surpassed by any other form of feeding.

49. Straw cut and slightly fermented is one-fourth more valuable for fattening.

50. Green oat-straw and pea-straw together are about equal in value to hay.

51. Thirty-five pounds Swede turnips, six pounds clover hay, and two and one-half pounds oilcake will produce one pound of beef.

52. One ton of fermented cut straw and two hundred pounds oilcake is equal to one ton of hay.

53. Six pounds hay, one pound bran, twenty pounds turnips, and five pounds corn-meal will add one pound to the weight of a good two-year-old steer.

54. Six pounds hay, one pound bran, twenty pounds turnips, and six pounds pea-meal will do the same thing.

55. The like quantities of hay, bran, turnips, and seven and a half-pounds crushed oats will do the same thing.

56. Corn, peas, oats and barley, will pay to fatten cattle when not over one cent per pound in the market.

57. Barley-meal gives a fine finish, and sleek, mellow handling.

58. In soiling, green fodder is safer when cut and mixed with cut straw or hay, allowed to slightly ferment and sprinkled with meal.

59. It is still an unsettled question whether cooked food or raw food is best for cattle fattening.

60. All animals fatten cheaper and faster on prepared raw food, as against whole or uncut hay and roots.

61. Every animal that chews the cud must have *bulk*; it is not enough to give sufficient nutritive value in small quantities,—the stomach must be filled to give material for ruminating.

62. Most foods are better in combination than alone.

63. Combine so as to have little or no waste.

64. Fat-producing and flesh-producing food *together* will give sixty per cent. more increase than when given singly.

65. For young cattle give 1 of flesh to 8 of heat-producing substances, and to older ones give 1 to 6.

66. Most food of young cattle goes to make up bone and muscle, leaving third-class manure.

67. Most food of half-grown animals goes to make flesh, leaving second-class manure.

68. Most food of mature animals goes to make fat and support life, the excess becoming first-class manure.

69. Exclusive of water chemically, animals coming to maturity will eat about one-fiftieth of their own weight per day.

The Management of Fattening Cattle.

70. Most animals eat in proportion to their weight, under average conditions of age, temperature, and fatness.

71. All animals increase in weight in proportion to the quantity and character of the food consumed, if fed exactly according to breed, size, and condition of surroundings.
72. Give fattening cattle as much as they will eat, and often—five times a day.
73. Never give rapid changes of food, but change often.
74. A good guide for a *safe* quantity of grain per day to maturing cattle is one pound to every hundred of their weight; thus an animal weighing 1,000 may receive ten pounds grain.
75. Early stall feeding in the fall will make the winter's progress more certain by thirty per cent.
76. Give as much water and salt at all times as they will take.
77. In using roots, it is one guide to give just as much, in association with other things, so that the animal will not take any water.
78. In buildings, have warmth with complete ventilation, without currents,—never under 40°, nor over 70° Fah.
79. A cold, damp, airy temperature causes animals to consume more food without corresponding results in bone, musle, flesh, or fat; much being used as fuel to keep up warmth.
80. Stall-feeding is better for fat making than box or yard management, irrespective of health.
81. The growing animal, intended for beef, requires a little exercise daily, to promote muscle and strength of constitution; when ripe, only so much as to be able to walk to market.
82. Currying daily is equal to seven per cent. of the increase.
83. The temperature of the body should be about 100°, not under 95°, nor over 105° Fah.
84. Don't forget one animal's meat may be another animal's poison.
85. It takes three days' good feed to make up for one bad one.
86. The faster the fattening the more the profit: less food, earlier returns, and better flesh.
87. Get rid of every fattening cattle beast before it is three years old.
88. Every day an animal is kept, after being prime, there is loss, exclusive of manure.
89. The external evidences of primeness are full rumps, flanks, twist, purse, shoulder vein, and eye.
90. A good cattleman means a difference of one-fourth. He should know the likes and dislikes of every animal.
91. It pays to keep one man in constant attendance on thirty head of fattening cattle.
92. Immediately an animal begins to fret for food, immediately it begins to lose flesh; never check the fattening process.
93. Never begin fattening without a definite plan.
94. A steady, frosty winter is better than an open one for cattle fattening in Ontario.
95. There is no loss in feeding a cattle beast well for the sake of the manure alone.
96. No cattle beast whatever will pay for the *direct increase* to its weight from the consumption of any kind or quantity of food—the manure must be properly valued.
97. On an average it costs, on charging every possible item, twelve cents for every additional pound added to the weight of a two or three-year-old fattening cattle beast.
98. In this country the market value of store cattle can be increased thirty-six per cent. during six months of the fattening finish.
99. In order to secure a sure profit, no *store* cattle beast, of the right stamp and well done to, can be sold at less than four and a half cents per pound, live weight.
100. In the finishing of a two-year-old for beef, during the last six months of winter, its financial history consists of three things of nearly proportionate values:—

(1) Value of animal, previous to entry for finishing 1,200 pounds at five cents	$60 00
(2) Cost (not value) of food for six months	35 00
	95 00

(3) Total value of fattened animal, 1,500 pounds at 7c	$105 00
Cash profit	10 00
(4) Value of manure produced	30 00
Total profit	$40 00

101. During winter, feed thus for finishing:—

First month:

Common turnips ... lbs.
Straw, cut ... 40
Hay, cut ... 7
Oats, crushed ... 5
5

Second and third months:

Swede turnips ... lbs.
Hay, cut ... 40
Straw, cut ... 7
Corn ... 3
Bran ... 8
2

Fourth and fifth months:

Swedes and mangolds ... lbs.
Hay ... 50
Corn and peas ... 10
Bran ... 10
3

Sixth month:

Mangolds and Swedes ... lbs.
Hay ... 50
Corn, peas, and oats ... 12
Bran ... 12
Oilcake ... 3
3

XI.—AN EXAMPLE OF THE APPLICATION OF THESE PRINCIPLES.

And now for an example of the application of these one hundred things that serve as a guide to the successful production of beef. This very concisely.

The Purpose.

We put up four yearling high-graded Shorthorn steers on the 21st October, for the purpose of showing at the Provincial and Toronto Exhibitions what, in our opinion, is the proper stamp for exportations to Britian. As this implies the ability to endure fatigue without any going back in condition, we have avoided what may be called over-feeding corresponding with age; when in September first, therefore, at Kingston and Toronto, they will stand as having been liberally, but not extravagantly, brought up from birth. At that time we expect the average weight to be 1,650 pounds when 920 days old. (See succeeding part of this report.)

The Animal.

Standing of Four Steers, 12th June, 1882.

NAMES.	Age in Days.	Weight at Date.	Daily Rate of Growth Previous to Stall Feeding.	Rate of Growth During Past Winter.	Rate of Growth for Whole Age.
Conqueror	881	1466	1.74	1.40	1.66
Chancellor................	878	1544	1.69	1.90	1.76
Champion.............. ..	816	1440	1.84	1.57	1.76
Commander..............	732	1445	2.00	1.86	1.97
Mean.........	827	1474	1.82	1.68	1.79

Our four "C's" on 12th June, weighed, on an average, 1,474 pounds, and as the mean date of their birth was 7th March, 1880, the daily rate of growth up to entry for stall feeding has been 1.82 pounds; the highest 2.00, and the lowest, 1.69. This is, as usual with young animals well done to, more than the subsequent rate during the winter's stall feeding on a very liberal diet of grain, fodder and cake. Conqueror was sick for a month, and thus shows a very low daily increase of 1.40, and, of course, reducing the average to 1.68; otherwise we would have had, I think, one and three-quarter pounds per head per day. The whole life rate stands well at 1.79.

The Food.

In this record it is but necessary to give what has been used since the change from store to stalling, beginning as already noted, on 21st October last. The average daily ration has been,—

	lbs.
Hay, long	12
Roots, Swede turnips, and mangolds..	35
Bran...	2
Grain, corn, peas, oats (in equal parts).............................	10
Cake, during last thirty-four days..	4½
Thorley's Food, for two months	¼

These sixty-three and a half pounds of materials, daily, cost thirty-five cents in the market, and seventeen and a half cents to the producer. As in this case the feeder was the producer, with the exception of the cake, corn, and Thorley's, I am allowed to debit the average cattle beast with the cost of production only. Thus the actual value of food consumed during the 234 days amounts to $40.36, which is equal to ten and one-third cents for every pound of increase to weight during that period.

As I have on previous occasions shown in what way fattening cattle pay for this apparently unprofitable feeding, it is unnecessary to repeat here.

As I write, I am offered $450 for these four steers, for exportation.

XII.—LESSONS GATHERED FROM 1881-82 WORK.

1. The scientific check in the fattening of cattle with three kinds of grain stands thus :—

——	Contain.	Nutritive Ratio.	Daily Results.
CORN, 10 lbs. daily :—	Per cent.		lbs.
Albuminoids (flesh formers)	1.00		
Crude Fibre	.55		
Carbohydrates (sugar, starch, etc.)	6.21	1:8.3	1.91
Fat	.65		
PEAS, 10 lbs. daily :—			
Albuminoids	2.24		
Crude Fibre	.64		
Carbohydrates	5.25	1:2.7	1.82
Fat	.20		
OATS, 10 lbs. daily :—			
Albuminoids	1.20		
Crude Fibre	.93		
Carbohydrates	5.57	1:6.0	1.60
Fat	.60		
Mean	....	1:5.7	1.78

2. The practical feeder asks: Why have we had most increase from the *least* proportion of flesh-forming materials, and where also there is the least nutritive ratio—1:8.3—which means 1 of flesh-forming materials to 8 of sugar and starch, etc. ?

3. If the amount of fat, along with sugar and starch in food, gives corresponding results to fattening animals, then the corn has taken its proper place.

4. Is the very high percentage of flesh formers—2·24—in peas, counteracted by the low proportion of fatty materials—.20—so that while the nutritive ratio is so very high as 1:2.7, the result in adding to the weight of a cattle beast is less?

5. What makes the Oat take a third place in this contest? Is it the possession of fifty per cent. more crude fibre, for there is nothing else very different?

6. On an average of the three grains we got a daily increase of $1\frac{3}{4}$ pounds per head by giving 1:5.7—that is, 1 of flesh-forming materials to 5.7 of sugar and starch.

7. Chemically the two cakes stand thus :—

——	Linseed.	Cottonseed.
	Per cent.	Per cent.
Albuminoids	28.3	34.3
Crude Fibre	11.0	9.6
Carbohydrates	37.3	27.4
Fat	10.0	10.9

8. The greater proportion of flesh-formers in cottonseed did not maintain animal life so well as where less of it was given, but accompanied with forty per cent. more starch and sugar—37.3 and 27.4. It is pretty evident in this example that heat and life were supported by the sugar and starch of the linseed, and also gave a slight increase to weight, while the cottonseed, having forty per cent. less of these, maintained life, but did not add to weight.

9. The world is yet largely ignorant of the effects of different soils, climates, foods, and modes of management, upon wool of various breeds of sheep, and too little attention is paid to the crop when grading for mutton. The manufacturer should pay only for so many teeth and spirals, *per inch*, with a certain texture and strength, making length a subordinate point, because length can be easily regulated.

10. The average weight of five kinds of grade fat shearling wethers was 162 pounds, or fully one-third of a pound per head per day—the exact weight suitable for exportation.

11. There are several things in cattle-fattening that cannot be found in books, yet principles to guide the profession are important and not difficult to follow. In the example given in the eleventh chapter herewith, it is plain that any ordinary intelligence may make 1,500 pounds live weight at two years and three months old, and realize a greater profit than by holding to three years.

THE FIELD PLOT EXPERIMENTS OF 1882.

These, as usual, have been carried on in field C—the four acres recently referred to —and in order to an intelligent comparison of results with previous years, previous reports and the weather of the present year should be carefully studied.

I.—Fifteen new Winter Wheats.

It should be borne in mind that in all our experimental work nothing is estimated or left to conjecture, but everything weighed, measured, or otherwise accurately noted.

The Fluke.—This was our heaviest and earliest cropper—cut on 26th July, and producing forty-three and one-quarter bushels of clean grain per acre, which weighed sixty-three and a half pounds per bushel, thus also the heaviest per bushel of any. The straw is of good quality, but rather weak, and only one and one-third ton per acre; grain a very superior sample, uniform in colour and plump.

The Ontario Experimental Farm. No. 3.—This is a bald variety that stood the winter well, ripened on 7th August with a bold head, strong straw and good average grain; produced forty-three bushels at fifty-five pounds per bushel only, and two and one-eighth tons of straw per acre.

The Ontario Experimental Farm No. 7.—One of our early maturers, 29th of July, of the bearded varieties, with a large head and free of rust in comparison to others. Sample of grain above the average and uniform in colour. One and three-fourths ton of straw, and forty-three bushels of grain that weighed sixty-two and one half pounds.

The Ontario Experimental Farm No. 8.—This is another of our early and bearded sorts, with heavy straw and large berries, wanting plumpness. Grain forty-two bushels, sixty-two pounds, and two and a half tons straw per acre.

The Ontario Experimental Farm No. 16.—In order of greatest produce of grain per acre comes this bald kind, with an average sized head and fair sample of grain, not uniform in colour this year. There is, however, the very satisfactory weight of sixty-three and a half pounds per bushel, two and a half tons straw, and forty-one and two-third bushels of cleaned grain per acre.

The Ontario Experimental Farm No. 11.—It is some satisfaction to find several of the winter wheats of our own choosing in 1876 taking a lead in quantities if not in quality. This is a variety with a large full head and good bright straw, but slightly touched with rust—maturing on 3rd August. The grain wants in plumpness, but is uniform in colour. Produce—grain, forty-one and one-third bushels, fifty-eight and a half pounds, and nearly two tons straw per acre.

The Fultz (bald).—This well-known wheat matured on 26th July, which saved it entirely from rust. It is a good stooler, sending up every stalk well, and ripening evenly. Grain uniform in every respect, weighing sixty-three pounds per bushel, and produced exactly forty-one bushels per acre, upon one and three-quarters ton straw.

The Washington Clawson (bald).—Having an even heavy straw, bright and free of rust, with large head, large berry, uniform in colour, and plump. The produce in grain was thirty-nine and two-third bushels, in straw one and one-seventh tons, and the grain weighed sixty and a half pounds per bushel.

The Ontario Experimental Farm No. 9.—Was somewhat winter killed, yet gave an even crop; average sized bearded head, with medium berry of a fair sample, produce $39\frac{1}{2}$ bushels weighing sixty-two and a half pounds, with one and a half tons straw per acre.

The Diehl Fyfe is perhaps an old friend under a new name, bald, good straw, somewhat small in head, a fine sample of grain, very uniform and plump. Per acre, thirty-eight and three-quarter bushels, weighing sixty-one pounds, with fully one and a half ton straw.

The Finlay (bald).—Another of our hardier kinds, with long clean straw standing well up and unaffected with rust. The head is on the small side, but gives a superior plump sample of grain that weighed sixty-two and a half pounds per bushel, two tons straw, and thirty-eight and a half bushels per acre.

The Turkey (bearded).—Head of an average size with medium plump grain of uniform colour; straw gave two and three-quarter tons per acre; grain thirty-seven and two third bushels per acre, weighing only fifty-eight and a half pounds.

The Blue Stem.—A bald, large headed sort with somewhat weak straw, and plump grain of irregular colour, weighing sixty and a half pounds per bushel; produce thirty-five bushels exactly per acre.

The Excelsior gave a very even crop of plants with grain of uniform colour, but not high in plumpness, that weighs fifty-nine and a half pounds per bushel, from thirty-four and one-third bushels, and one and one-quarter ton straw per acre.

The Clawson Club.—An even crop on the lightish stamp in straw, with a good he grain shrunken, and weighed only fifty-six pounds per bushel. Produce per acre thirty-three and one third bushels.

The Rust Proof (bald).—This maintained its name this year for clean bright straw; head short, with a superior and plump berry; straw two tons fully; grain, thirty-three and one-fifth bushels per acre, and sixty-one pounds per bushel.

The Tappahanock (bald).—Head of average size and a medium plant in other respects, with an uniformly fair sample of grain-plump; nearly three tons of straw per acre; grain, thirty and a half bushels per acre, weighing fifty-nine and a half pounds.

I give these fifteen varieties because of their comparative rareness and being above the average in produce per acre. The average produce has been forty bushels per acre, weighing sixty and a half pounds per bushel. All evidence of a propitious season if nothing else.

II.—Some Oats in Opposition.

In this we desire to present, from among others, those that are comparatively new—at least by name, and to note the very great difference in produce from some of the old sorts. All were treated alike, and conditions otherwise in every respect alike.

Black Tartarian (from Scotland)	58 bushels per acre.
Norway	43 " " "
Black Brown	41 " " "
Fort William	38 " " "
Arabian	38 " " "
Washington	34 " " "
White Flanders	31 " " "
Black Hungarian	19 " " "
Hulless	15 " " "
Edmonton	10 " " "

III.—Barley in Opposition.

Here, also the case is one simply to ascertain the produce of kinds under precisely similar conditions.

Spring barley	39⅔	bushels	per	acre.
Potter's Prize	37⅔	"	"	"
Russian	37	"	"	"
Probestier	31	"	"	"
Washington, six-rowed	35⅔	"	"	"
Carter's Chevalier	30½	"	"	"
Hallet's Pedigree	29	"	"	"
Thanet	26	"	"	"
Hulless	25	"	"	"

4.—Seventeen Forms of Manure and Grain.

This is the fourth crop of grain since the application of the several manures in 1879 and as it is desirable to present the facts of these experiments in a very concise form this year, I beg to refer to previous reports for all the connections, and to the abstract produce of the previous years as follows :—

FERTILIZERS.	1879. Wheat.	1880. Wheat.	1881. Wheat.	1882. Oats.	Average produce per an'm.
	Bushels.				Bushels.
Farm-yard manure and nitrate of soda	23	8¼	41	73¾	49
" " "	23	7¼	40	69	35
" " bone dust	22½	6¼	35	60	31
" " gypsum	21¼	7½	32¼	45	26½
Lime compost	20½	8½	38¼	77½	48¼
Farm-yard manure and gypsum	20½	7	28½	60	29
" " salt	20	5¾	28½	46¾	25¼
" " "	20	6¾	35	48½	27½
" " minera superphosphate ...	19½	5	30½	62⅓	29¼
" " bone dust	19½	4	31⅓	61¾	29
Salt	17½	4¾	28	33	21
Gypsum	17½	6¼	28	60	28
Nitrate of soda	16	5¾	31½	56½	27½
Bone dust	16	5¼	26	26½	18½
Farm-yard manure and M.'s superphosphate	14½	7	31	58¼	28
Mineral superphosphate	14	3½	29½	45½	23
Farm-yard manure	13½	8¼	30½	55½	27
No manure	13½	8¼	31¼	50¼	27
Average from manures	....	....	....	....	30⅛
Average unmanured	....	....	....	....	27

In closing this experiment, as now necessitated by change of plots, a few observations may be made. The four years cropping after manure must, to a considerable extent, be taken as evidence of the influence of any manure to produce crops, and the mean of these years should form a good general average; the last column of the table gives this. Soil that has for four years in succession produced an average of twenty-seven bushels grain without manure cannot be called impoverished,—and I must refer to my first report on this subject for evidence that the land was neither rich nor poor by management previous to 1879. Now, where do we have in these seventeen results any clear and unmistakable facts to guide the farmer, or even the experimentalist?

In all the manure accounts there are but three marked cases of produce superior to that unmanured; these are farm-yard manure mixed with nitrate of soda, lime compost, and farm-yard manure and bone-dust. The average of all the produce from the seventeen manures is not more than three bushels over that unmanured. This, to my thinking is further evidence of a character of climate in Ontario, which, with proper cultivation and rotation of crops, demands much less help from fertilizers than the same soil would under a less propitious climate and other conditions.

5.—Room, Air, and Light *versus* Fertilizers.

Two years ago we set aside one plot of one-fourth of an acre to test two special fertilizers, called Marcon's superphosphate and animalized carbon. For this purpose the plot was subdivided thus:—

1.—Without manure.
2.—Marcon's superphosphate.
3.—Animalized carbon.
4.—Without manure.

The crop of 1882 was Australian oats, and produced from

No. 1..
" 2.. 62 bushels.
" 3.. $33\frac{3}{4}$ "
" 4.. 53 "
.... $55\frac{1}{4}$ "

The average of the two unmanure plots is $58\frac{1}{2}$, and of those that received manure, $43\frac{1}{2}$ bushels. This difference of fifteen bushels per acre in favour of the unmanured cannot be accounted for unless by stronger, more vigorous, better tillering, larger heads, and therefore more grain by the plants receiving more light, air, and room. The three open sides and ends of plots 1 and 4 had unquestionably an immense advantage over 2 and 3, which were enclosed everywhere but the two narrow ends. There is an important lesson in this to everybody, and particularly to the experimentalist, whose results, unless thus checked, may be very misleading. On this subject, see my report herewith on the new experimental field.

6.—Bone Dust, telling from 1878.

Five years in some soils and climates, will, by continuous cropping of grain, tell severely on the permanency of most manures. Naturally we would expect those that are less easily washed away, less assimilative, or more permanent in their character, to be in a position to aid crops the longer the time after application. The case here is not difficult to understand :—

	OATS.
4.—Bone dust.	........56½ bushels.
3.—Gypsum.	........41 "
2.—Nitrate of soda.	........49½ "
1.—Mineral superphosphate.	....43½ "

7.—Lucerne *versus* Farm-yard Manure.

In this experiment, which was particularly noticed last year, it is only necessary now to observe the continued power held by the clover. The crop of 1882 was Australian oats, and a somewhat inaccurate division of the crop, caused by overlying, gave this :—

Lucerne	70½ bushels per acre.
Farm-yard manure..............................	45¾ " "

This looks so important that it must be continued in our new field plots.

8.—Permanent Pasture and Sheep.

This is a continuation of the experiment to test the ability of a mixture of grasses and clovers to maintain so many sheep per acre per annum. The land was seeded in 1878, and previous reports will show what conduct has been every year since. I need not record all the conditions of season 1882, but that grazing was begun on 18th May, and closed on 27th September, with intervals as required by size of plot, and growth during the season. Summing up, we have the fact that one acre of properly seeded and properly managed permanent pasture, during the fourth year of its establishment, maintained nine and nine-tenth's sheep, or about ten large sheep. Grain was given during grazing for which an allowance of fully one-fourth should be made—thus reducing the number to seven per acre. This, in another form, means one and one-half cattle beast per acre.

9.—Some new Swede Turnips in Opposition.

Sowed on 20th June, under ordinary management, and harvested quantities as follows :—

	Bushels per acre.
Marquis of Lorne..	741
King of Swedes	663
Carter's Imperial..	652
Bronze Top	639
White Swede	592
Shamrock	534
Providence	491

10.—Mangolds and Sugar Beet.

We submitted a very large variety of these to a thorough test under similar conditions. Sowed on 6th May, and harvested as follows :—

KINDS.	Number of bulbs per acre.	Average weight per bulb.	Bushels per acre.
Mangolds.		lbs.	
Lane's Improved	15746	2.09	753
Mammoth Long	9174	4.89	748
Carter's Warden	8024	4.54	602
Red Globe	12649	2.08	574
Average	11393	3.40	670
Sugar Beet.			
White-grey Top	13066	4.73	1079
White-green Top—Brabant	11676	5.55	1031
Electorale	13066	4.52	984
White-green Top	13900	3.08	892
Early Rose	11398	4.56	866
White-red Top	13066	3.08	839
French White	12649	3.74	790
White Sugar beet	12726	3.21	698
Imperial beet	13761	3.04	697
White Vilmorins	10286	3.05	607
White Small-rooted	14734	2.36	580
French Yellow	8479	3.34	473
Average	12400	3.80	794

11.—Varieties of Potatoes.

Similarly with potatoes, as others, we are continuing the test of their productive powers ; planted 29th May :—

	Bushels per acre.
St. Lawrence	286
Dempsey	247
Late Rose	223
Early Ohio	204
Eureka	201
Brownell's Superior	161
Snowflake	155
Peerless	150
Beauty of Hebron	131
Peach Blow	111
Mean	187

V.—Horticulture and Arboriculture.

For several years past I have asked to be relieved of what has been for all practical purposes, but nominal—the superintendence of the Horticultural Department. During your visit in October last you kindly left this subject entirely in my own hands, and accordingly, I did not hesitate in saying good-bye to what I have been of little advantage, though a well-wisher. In the hands of Mr. Forsyth and the Committee of the Ontario Fruit-Growers Association you may look for increased vigour and well-doing. I have no doubt they will report to you this year in regard to the alterations on the pleasure grounds, the new orchard, vinery, and arboretum, the progress of the field tree clumps and tree seed beds. As I do profess, by right of British servitude and certificate, an intimate acquaintance with Arboriculture, I shall use the privilege of saying something upon such an important branch of our rural economy as circumstances may demand.

VI.—The Mechanical Department.

The value of this department to the farm, garden, College, and students, is most gratifying. I have often spoken to you regarding Mr. McIntosh's worth as a conscientious and able instructor, always commanding the respect and confidence of everyone. His report to me follows, and the recommendation for assistance has my approval as you know.

Mechanical Department.

Wm. Brown, Esq.—

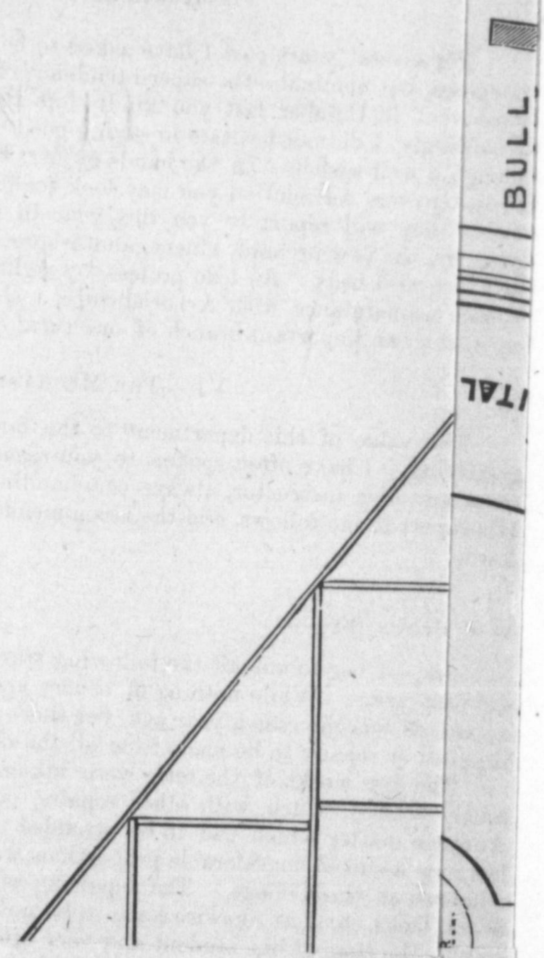
Sir,—I beg to submit the following statement from the Mechanical Department for the past year:—While nothing of a very special nature in new buildings has been required, as was the case a year ago, yet there has been a constant demand for wants to be supplied or repairs to be made from all the other departments.

The first weeks of the term were taken up with completing the new buildings recently erected, which, with other repairs, occupied a good part of the winter months. Another matter which had to be attended to when the cold weather set in, and which has now assumed considerable proportions was the repairing and putting up of the winter windows in the College. The repairing of furniture such as bedsteads, chairs, desks, doors, locks, etc., has likewise come to be no inconsiderable item of labour. These repairs employ the time of one student and very often one or more assistants. A number of the students were employed in making field gates, wheelbarrows, feeding troughs, waggon-boxes, hay-racks, stone-boats, whiffletrees, fork and rake handles, etc. For the garden there were several hot-bed frames and sashes made, and a number of snow shovels. The farm implements were examined and all put in working order, which brought us to the Easter holidays.

After the spring vacation work was resumed, all the field fences and gates were examined and repaired where needed, a number of tree guards were erected, and a quantity of our portable fence hurdles made and set up where required. About this time you showed me a plan of what is called the Oakville portable fence. We accordingly made some of that by way of experiment, and although we found it more expensive than the one we have used for several years, yet it certainly deserves a first place as a good, substantial movable fence, and although we have not yet adapted it as a continuous field fence we found that it would suit admirably for small pens. We have now on hand about fifty pens which were in use at the late annual sale, and which can be speedily placed or removed.

About the 10th of August we began to prepare for the sale by having a number of shipping boxes on hand for shipping sheep and pigs. This somewhat formidable job has been made comparatively easy by the introduction of machinery into the shop for preparing materials. In this connection I would again remind you of the machines we still need, viz., a turning lathe and a surface planing machine.

We have not done any great amount of field fencing this season, although there is yet a good deal required for dividing fields and along a portion of the boundary. After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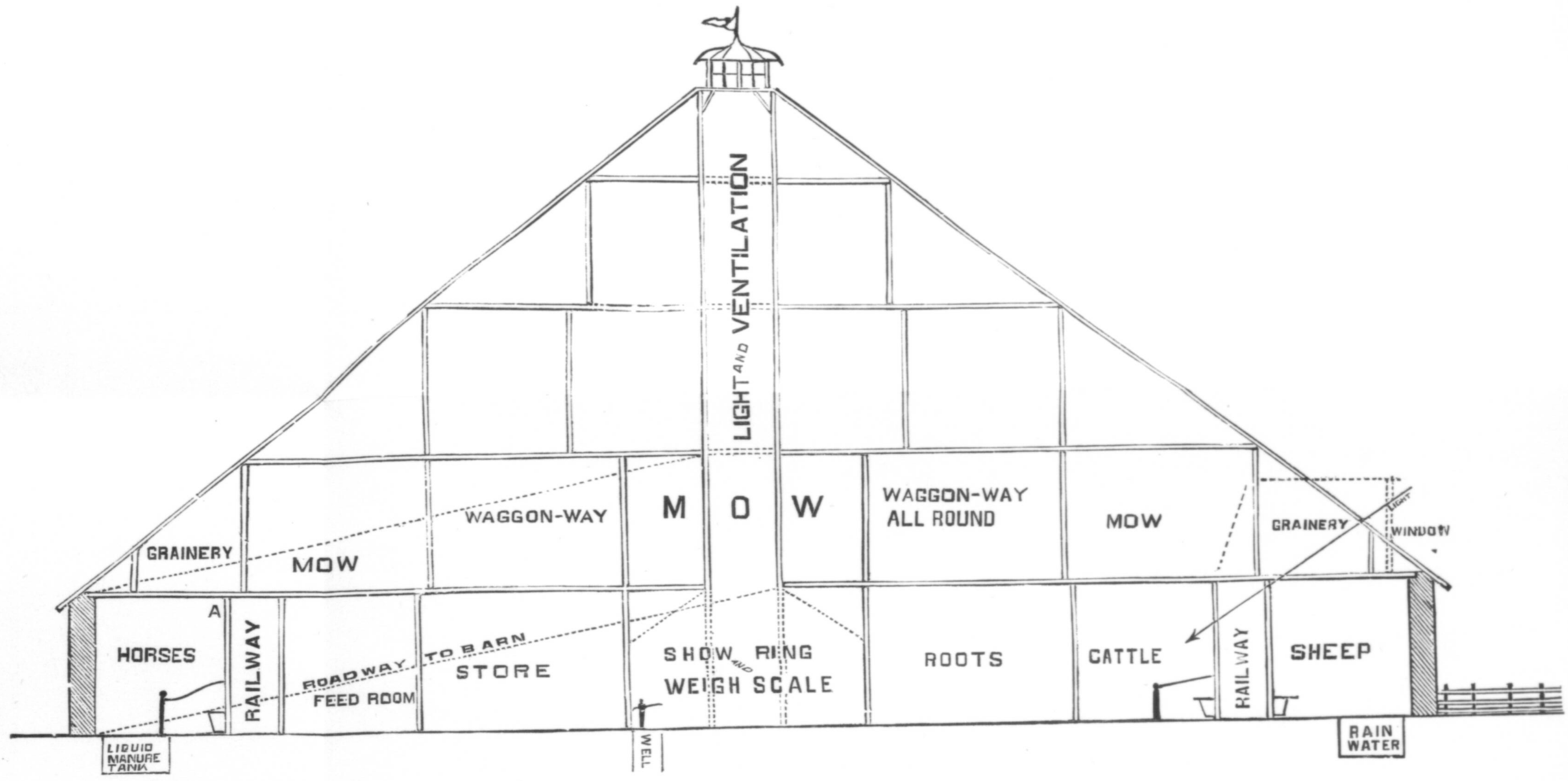
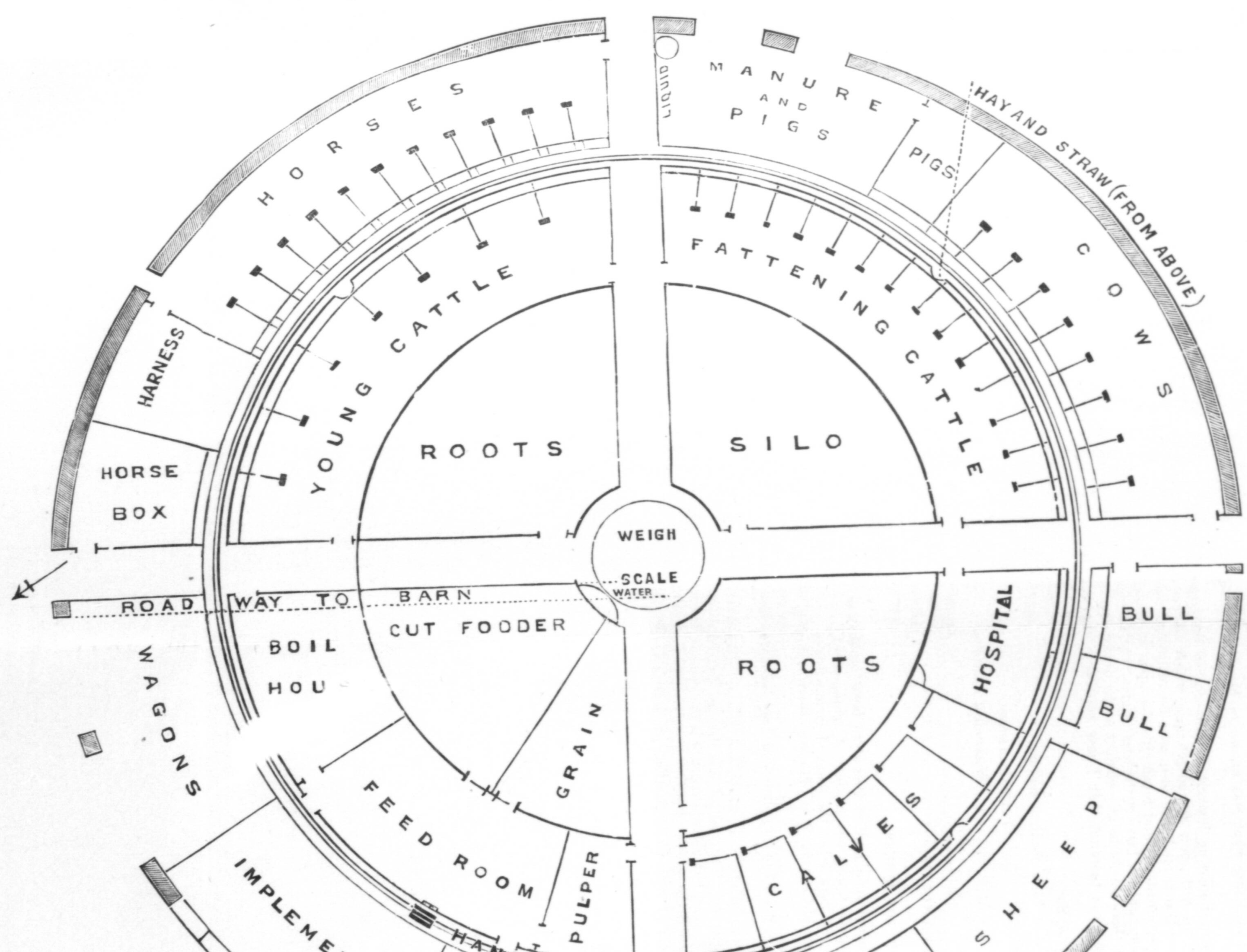
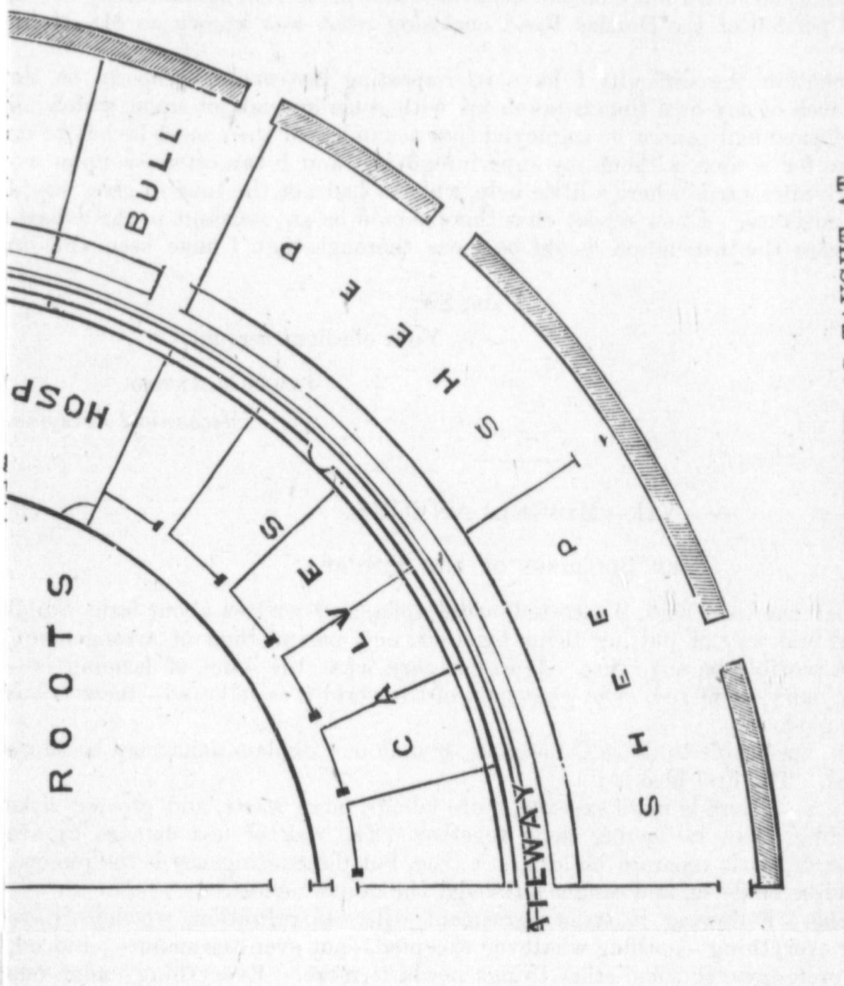


GENERAL SECTION OF CIRCULAR COVERED FARM BUILDINGS.



FARM BUILDINGS OF THE FUTURE: PLAN ILLUSTRATING PRINCIPLES IN ARRANGEMENT, AS TAUGHT AT THE ONTARIO EXPERIMENTAL FARM.



TING PRINCIPLES IN ARRANGEMENT, AS TAUGHT AT
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the seeding down of the fall wheat in field No. 16 we found it necessary to erect about forty rods of a post and board fence on the north side as a protection against stray cattle, and also a small portion of the Dundas Road enclosing what was known as Mr. Halliday's acre.

I would mention the difficulty I have in imparting instruction properly to the students. So much of my own time is taken up with some special job upon which all who are in the department cannot be employed that a number of them must be left to do the best they can for a time without my superintendence, and I can often see upon examining the work afterwards where a little help, which I had not the time to give, would have prevented mistakes. I now repeat that there should be an assistant in the department, in which case the instruction would be more thorough than I have been able to make it as yet.

I am, Sir,

Your obedient servant,

JAMES McINTOSH.

Mechanical Foreman.

VII.—MISCELLANEOUS.

FARM BUILDINGS OF THE FUTURE.

After all that has been said, illustrated, acted upon, and written about farm buildings, there is but one way of putting them together, only one method of arrangement, and there cannot possibly be any other. I do not care what the kind of farming is—whether grazing, dairy, or mixed, or in what part of the world it is followed—there is but one principle to guide all.

Take a case, applicable to us as Canadians, so that our explanations may be more easily understood. The first idea is:

Centralization.—There is more expense, more labour, more waste, and greater risks in isolated buildings than in having them together. The risk of less damage by fire when fire does occur, with separate buildings is true, but the contingency is too remote, or at least should be made so, and cannot outweigh the others named.

One Covering.—Following in strict agreement with centralization, we must have one covering for everything—nothing whatever excepted—not even the manure; indeed, the manure in preference to some other things needs it more. Everything under one cover adds to comfort and economizes labour, lessens weather influences—cooler in summer, and warmer in winter, and ensures a profitable collection and distribution of rain-water.

Storing of Food.—The true principle of storing is to store, not to scatter; in this there is true economy of labour, economy of buildings, less waste, and particularly the being able to arrange the various animals *around that food according to their requirements.* Who would place a sheep nearer the store than an ox, so as to secure what we have indicated? As the fattening steer needs more weight and variety of food than any other of our domesticated animals, why place him away from the roots, grain, fodder, bedding, and manure pile?

Food Classification of Animals.—Those eating most, such as fattening cattle and store cattle, and so making most manure, to be nearest the food, and nearest the manure pile, so as to save labour, and those requiring most light and most air such as sheep, cows, and horses to be away from the centre, and thus getting more light and air; so also

Working Classification of Animals.—To be nearest the work, nearest the implements, and most "handy" for men, horses especially should be, so to speak, outside.

Health Arrangement.—Ventilation and light in individual sections, by overhead and windows, ventilation and light by two great roads crossing in centre; an hospital for sick animals neither warm nor cold, nor with too much nor too little light, and drainage from all parts centering in tank in neighbourhood of manure.

Preparation of Food.—Centralized as it is, with all the *green* fodder on a level with animals and all the dry fooder—hay and straw—in the barn overhead, its preparation for consumption is the next consideration. It matters not whether the food is machine prepared or not, the principle in the arrangement is not affected. Assume, however, for the sake of meeting most difficulties, that machinery is used. Steam or horse power will be necessary overhead, under cover, to drive straw cutter above, grain crusher below, and root ... per below. The lower machinery should adjoin one of the main passages for the sake of room, light, access with materials, and near to the green fodder; the cut dry fodder drops from above into an apartment beside the feed or mixing room. In the *feed room* materials are prepared for distribution in whatever form is considered best, and, in order to assist in this, as well as to be used for other purposes, the boil-house should be close at hand.

Distribution of Food.—Now comes the beauty of centralizing everything. With the feed-room now as our sub-centre, it is required to serve every animal rapidly, easily, without personal danger, and without leaving any food anywhere but in the proper place. In explaining the distribution consider that the whole mass of buildings consists of *three* sections: (1) The outside section containing some of the animals and all the dead materials; (2) the middle section containing the remainder of the animals and all the *prepared* food; and, (3) the inner section, which alone is the *store.* Between the first and second sections there is a passage having on either side *food access to every animal in the building.* Rails and a hand-car or two, if required, in this passage completes the arrangement for distributing food, with the addition of two or three shoots from above to obtain hay and straw.

Cleaning.—The animals requiring daily removal of manure, that from tied-up animals—not sheep, calves, or bulls necessarily, or at least proportionably less—are arranged in strict accordance with economy of labour, and may be done by rail, by hand, or by barrow—throwing the manure over the low fence that separates the pit from the railway.

Water and Weighing.—These should be central, and on the line of the great roads of the building, where waggon-loads, animals, or anything else may be weighed, and all live stock drink under cover. There should also be a weighscale on the track opposite the feed-room, in order to check quantity given per head when necessary.

Outside Courts.—Any number, and arrangement of these are simple, and would be required for poultry, sheep, and bulls.

Aspect.—The way in which the building faces east, west, north, or south is important. Horses having to go to work early and return late, sunshine is not so material to their range as other animals that are housed all day, so, therefore, the implements and horses should have the northern aspect.

Access to Barn.—The large diameter of the building admits of an easy slope on one half of it, so that this access is under cover, and practically there need be no barn door of the present-day-style, and no opening except for ventilation. The slope of this roadway to barn will not interfere with any of the ground plan, and lands above to suit division of mows.

Plan.—The principles thus laid down are illustrated on the accompanying plans. I invite the most severe criticism upon their details. The circular form is best adapted for such an illustration, but an octagon, an ellipse, or even a square would answer, though not so conveniently. There is no reason whatever why a circular building should not serve in actual practice; the expense, I think, would be more.

Description of Circular Farm Buildings.

The principles of construction and arrangement have already been explained, and though the plan and section are plain enough it may be necessary to add some explanations.

The size can, of course, be more or less, according to requirements; in this example the diameter is 150 feet. The building is a complete circle, cut on the ground floor into quadrants by two cross-roads wide and high enough for a waggon load, and occupied at their intersection by a weighscale of the usual kind—say three tons maximum. Across the diameter in any direction the ground floor is divided into nine parts—that is a centre with four on each side. Entering at any of the four main doors, the first section is laid off for the lighter class of animals, such as sheep, pigs, poultry, cows, and those required for labour, as horses. As a matter of convenience, the implements, manure and bulls are also in this section. Immediately adjoining this outer rim is the hand-car railway—completely round the building, having no break whatever, and forming the second section. The third section is occupied by cattle of all kinds, except cows, one quadrant being devoted to fattening stock, and the other to young cattle; another to calves, and the hospital; and the fourth to food preparing arrangements, such as boil house, feed-room, from which all prepared food is distributed by the hand-car. It will now be observed that every animal in the building can be supplied with food, *at head*, by this circular railway; that hay and straw from shoots above connect with the same, and can be taken to all parts right and left. A large part of the manure can also be taken to yard by car, in addition to water and any form of material. The fourth section is the root and feed stores, with water from a well for general use—easily approached from all quarters. Light, if required at any particular point, may be secured easily, as shown in section; ventilation is abundant with all the roads, and may be added to by over-head traps to any of the sections, as example at A on section of horse stable. The liquid from manure and all the stables is collected in tanks, so as to be entirely withdrawn or re-distributed over the pile. Rainwater from the roof also is stored underground, to be utilized for any purpose. The entrance to the barn slopes from the ground level of outside wall to the centre—being an easy ascent of one in five. The conduction of light from the window dome is a special feature—that, in a smaller building, may not be necessary, but here of importance, especially as it is of some practical value to form the intersection of the cross-roads where the weighscale stands into a show ring, where, for example, a purchaser can examine any animal on a wet day. This show ring could be extended to thirty-five feet in diameter.

On landing in the barn from the sloping roadway, the horses and waggon can be driven all round between the mows—there being a centre and one side mow, that can be made into many divisions. Two granaries take up part of the outside mows, and the space above all, right up to the roof, is ample for large quantities of hay and straw; indeed, the waggon-way itself could, in a press, be utilized for storage.

SCIENCE IN THE ADAPTATION OF SHEEP TO THE PHYSICAL CONDITIONS OF A NEW COUNTRY.

Advanced as we think ourselves in agricultural knowledge in these days, there are some departments of it as much undeveloped as are the natural resources of this magnificent continent. Science, as it stands, through chemistry and some other fields of enquiry, is now the inseparable hand-maid of tillage in all its relations, but I know of little or no co-partnership existing as a systematically applied science with facts in the adaptation of the live stock of the farm to the physical conditions of a new country. All animal life, we know, is influenced more or less by a variety of physical agencies; but sheep having the greater range of any other class, I shall confine myself to the elucidation of this subject by their agency; because, also, no domesticated animal is so dependent in all its requirements upon these conditions—changing its form, rate of growth, weight and quality of wool, and quantity and quality of flesh by the favourable or careless arrangement or selection by man.

There is probably no part of the world without a native breed of sheep, or a variety giving hair or wool closely allied to sheep proper.

Australia may be an exception to this rule, but no other land of much extent. Thus, then, every possible physical condition has its adapted wool and mutton. We have no case in the past of success in establishing the breed of one country in another by leaving the animals to shift for themselves, as they had done on their own natural runs. Naturalization, then, is not a case of leaving things to nature, but the selection of a breed from one country to another so as to obtain equal, and, if possible, superior results by the adaptation of all the conditions known in its previous history, or by careful and gradual change of old habits to meet any new conditions. This does not imply so much time and expense as may appear to those unacquainted with the plastic character of sheep in the hands of him who is scientifically and practically skilful as a breeder of them.

All improvements invariably radiate from a centre, but they do not flow equally in all directions. In tillage proper, the soil, altitude, geographical position, rain-fall and temperature, together with man's prejudices, tend, individually, and in combination, to turn aside or altogether dam up the regular flow. The distribution of sheep has also been regulated by these influences, and thus we find in older civilized countries distinct breeds of sheep in immediate association with the physical conditions best suited to their profitable development.

On the physical map of the world, the wonderful islands called Great Britain, are but a small green spot of some 77,000,000 acres; to the flock-master, two-thirds of this—while nothing more than a few extensive runs in America—are fields of gold in wool and mutton, and, to the man of science, they possess a variety of interesting and instructive physical characteristics which probably do not exist within a similar extent in any other part of the world. There, therefore, the land is clearly mapped out by certain prevailing classes of sheep. It does not require a profound naturalist to pronounce, for example, the Southdown and Leicester of England as decidedly the result of climate, pasturage and culture.

Here I wish to make several assertions that to some may seem overdrawn, if not largely untrue. There is no other country in the world that is capable of either establishing or maintaining so perfectly different breeds of cattle and sheep as Britain. All the wealth, intelligence, and enterprise that have been displayed in the upbuilding and maintenance of her herds and flocks have not been more than, if equal to, the same things in other countries. There is no prominent breed of cattle or sheep, according to modern standards, the history of which is not practically on this side of 1780, and this is not much more than much of the same thing in the United States of America. Why is it that none of the cattle and sheep of Britain can be maintained in all their original virtue in any other land, or why is it absolutely necessary to obtain systematic importation of new blood from Britain in order to uphold this virtue? Wealth overflows, intelligence on the average is superior, and enterprise and experience are great fields, yet Englishmen in a foreign land cannot do what Englishmen at home have done and can do. It is simply because physical conditions are unpropitious for such maintenance. I know of no examples on this continent where a herd or flock is not indebted to an infusion of new blood during the last decade. It is not a thing of choice, of fancy, or of fashion on the part of the American and Canadian breeders; it is a pure matter of necessity in order to uphold *character*. Not even so, but I hold it is a simple impossibility in the present physical condition of this immense land to *make* a breed of cattle or sheep that will be equal in all essentials to what Bakewell, Collings, Bates, Booth, Ellman and others have handed down to us. I cannot allow any one to point to the Merino sheep as evidence of permanent adaptability here or elsewhere, because they are not what we want in these times of high pressure and no waste. Wool value is but one thing, and one thing is not enough. I have no desire to under-rate the capabilities of the American continent; it is not foreign to my subject, and at this stage of it, to say that as there is no land with so many physical varieties so there is none where health of live stock can be so easily regulated, and where so little troubles in order to require regulation. Practically, sheep diseases are comparatively unknown, particularly north of 40° and west of 90°—a circumstance following naturally the special physical conditions. It is a humbling reflection upon man's work in this regard that his science and practice in the adaptation of the best animal and plant life to the physical conditions of either an old or a new country are sure to be accompanied with what are called "drawbacks"—what are, of course, the natural concomitants of propitious conditions of one life for those of other lives. I know of nothing to mar the almost unlimited first-class production of beef, mutton and wool in the western hemisphere, but I do see some things in the way of maintaining *blood and character*. Thus, then, my subject opens up a great field of enquiry. Irrespective of artificial food and man's modification of the laws of nature, the adaptibility of certain grounds and their associations to a particular development of carcass and wool, are of

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BREEDS OF SHEEP,

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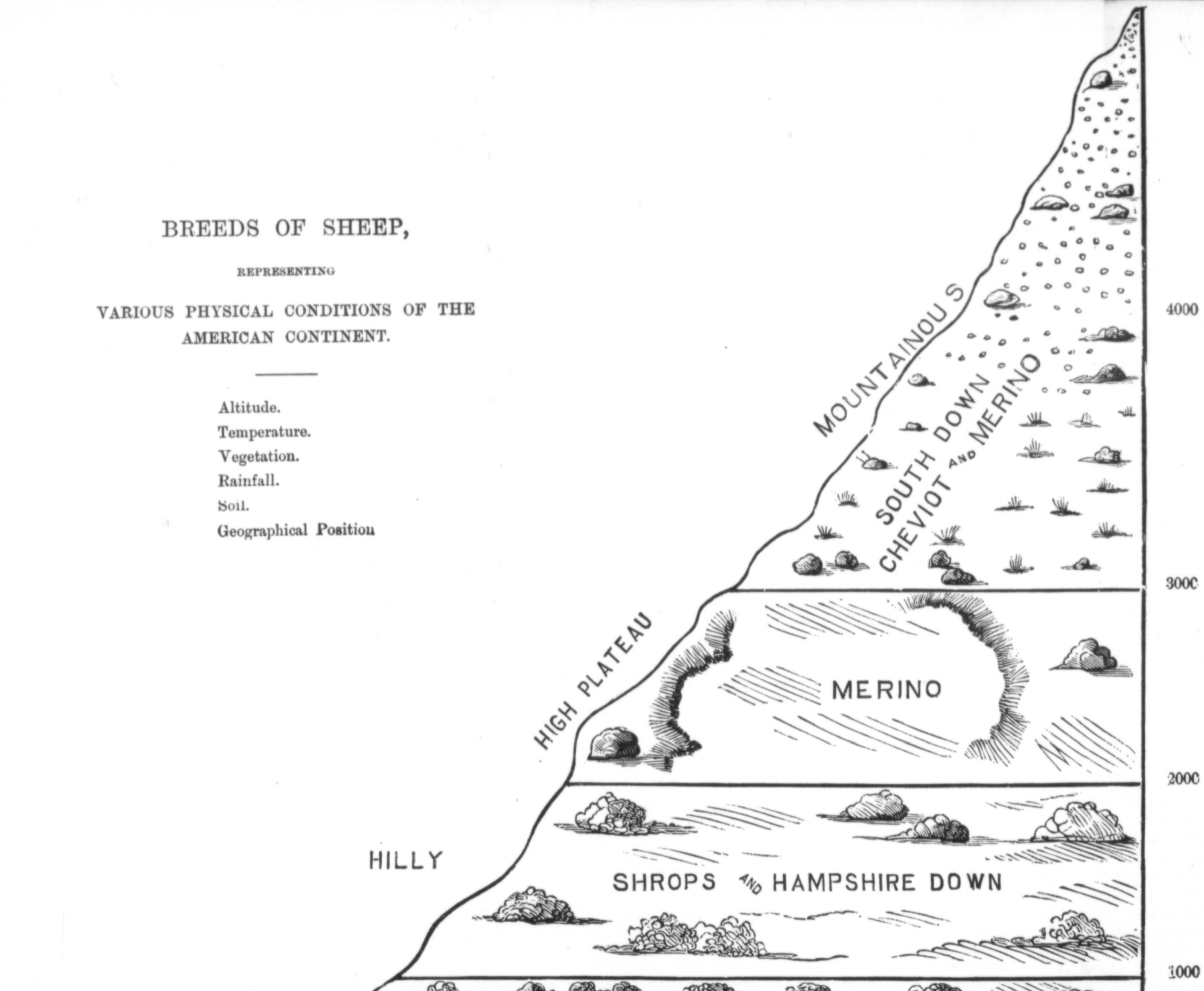

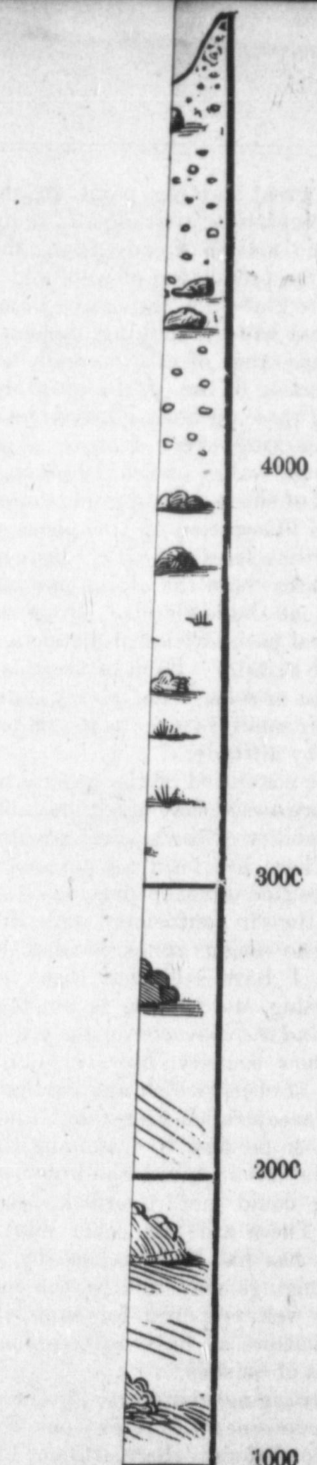

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course the great starting point in sheep husbandry. The nature of the soil, drainage, rain-fall, vegetation, altitude and temperature regulate the breeds.

It is no matter of contention, therefore, that in order to secure the best possible results in the production of wool and mutton on the American continent, it is absolutely necessary to place the respective breeds among physical conditions as alike as possible, to those that had the making of them. Exact agreement is likely impossible, but under the immense range of *altitude soils, temperature, rain-falls and vegetation* that we possess, no other section of the world could do more than we can as there is every possible combination of these on both sides of the equator. A physical map of the United States and Canada, showing every feature of the country as applicable to our subject, would be of great national value, and which, being coloured according to the known habits of the leading breeds of sheep, would guide the outside flock-master as well as the resident.

As an illustration of this phase of rural economy, I submit what I was asked to do for the British Isles in 1870 ("Brown's British Sheep Farming"). As a general rule the granitic rocks claim the alpine pastures, the limestone and its associates the uplands, and the sandstone the lowlands. If we take these as representatives, and make allowances for geographical peculiarities of districts, we have set down pretty distinct bases for the sheep grounds of Britain. Each of these is distinguished by striking physical characteristics besides that of soils. Their very outlines, for example, at once indicate each, and of course their main features as to temperature, rain-fall and herbage—all being more or less regulated by altitude.

While convinced of the general adaptibility of Britain for sheep stock in its natural state, we are aware that much, both of the suitability of the sheep's constitution, and even the applicability of the several grazings to them, have been brought about by improvements. There has been an agreement of three points in this state of things—the natural disposition of sheep previous to man's modern breeding of them, and his keeping this up to the time in conformity with the altered circumstances of the country and cultivation, and the various zones, have all blended to make the present stock of Britain.

Now I have said that these physical conditions are the great starting point in sheep farming, and thus it is not too much to say that management depends entirely on *breed and the character of the ground*, yet it is too much to affirm that any examination of a new country, however minute, will enable anyone to decide as to the number and class of sheep which any particular run will best maintain. The party long in possession of a sheep ranch knows by an accumulation of circumstances—ordinarily called experience—so far how to economise the various conditions of his subject. In the majority of cases, he has acquired the knowledge by practical facts brought home to him—things which he could not overlook, because they appealed directly to his purse—for and against. These are just other names for scientific deductions which the purely practical man has had to purchase by a long experience. The best judge of sheep and their belongings may not be the most successful graizer; the purely practical man cannot be so well prepared for emergencies, and able to take such an impartial and safe view of matters as he who combines with practical knowledge a judicious use of the deductions of science.

In arranging, therefore, for the growing of wool and mutton on a large scale on the American continent, it is obvious we have only to consider the two things—breeds and physical conditions—the market of course being a point of no doubt.

The accompanying diagram represents, in section, the mean of all the characters of sheep grazings in the United States and Canada from the sea up to an elevation of 6,000 feet. I am aware that some good pastures, such as in Wyoming, exist at over 6,000 feet, but being exceptional are excluded, just as we always exclude the low marshy lands in such a calculation.

In the choice of locality then we are first of all guided by geographical positions as indicated by latitude and longitue, because these materially affect temperature, rain-fall and vegetation. Indeed, there are parts such as California, British Columbia and Nova Scotia, where, inside of a range of fifty miles from seaboard, we have a complete copy of these physical conditions, yet in other cases one thousand miles do not limit the range of the diagram.

Altitude regulates temperature, rainfall and pasture, and pasture is also of course affected by the nature of the soil, which in turn varies according to geological formations either near or at a higher elevation. Over this great range of physical conditions there are annually millions of dollars in wool and mutton still untouched, and suitable for all the types of sheep of acknowledged merit.

Lovers of Leicester and Lincoln will find everything to suit the well-known habits of the heaviest sheep of the world upon low rich lands between the sea and five hundred feet inland, where much food can always be had within small space and easy conditions; even much moisture is not objectionable so long as the bed is dry.

A step up will not greatly alter conditions except as regards some change of grasses and soil with a swelling surface. Here the heavy but active and hardy Cotswold and Oxford Down will find a home in every essential, and where a trespass either above or below would do no harm. One thousand feet above sea level on a large continent appears as a flat in comparison with the same thing on an island such as Britain, but such are the marked effects of altitude and less shelter with change of vegetation that Leicester and Lincoln could not possibly give the same profits on these uplands as upon the lowlands.

The sheep division of most countries is invariably one wealthy in varieties of grasses and other plants relished by sheep—valley, river-bed, slope, and broken hill side, offering every possible sort of soil and aspect. I have in remembrance a very marked example of this in Perthshire, Scotland, where in valuing a grazing, that held 6,000 head, I had to take into consideration the superior condition of about one mile of a valley slope that was regularly top-dressed in heavy rains, with washings from broken rock above, that was largely charged with *plumbago*. Here an early rich bite was always sure for ewes and lambs. Limestone, horn-blende and other minerals have also their distinctive vegetation. The medium sized, active and hardy Shropshire and Hampshire Downs should do well in this division. Another step up takes us to the Merino, and another to the Southdown and Cheviot breeds. I have been in some doubts about placing the Merino as high as 5,000 feet, but knowing that theirs is a case of wool more than mutton value, and that a steady temperature with moderate keep are best for production of pile and texture in their own country, the same should apply here.

I have no hesitation in offering the most severe physical conditions to the prominent flesh quality producer of England. The grandly constituted Southdown is admirably suited for short sweet pasture, where moderate weight and highest value of mutton with moderate weight and second highest value of wool, in all our list would bring down gold from mountain tops and probably return as much per acre as those upon the sea shore.

Acknowledgments.

We have pleasure in acknowledging the receipt of the following donations, each of which will be experimented with as directed :—

Two barrels carbonized saw-dust, as a fertilizer, from Messrs. H. B. Rathbun & Co., Deseronto, Ontario.

Two bags carbonate of lime flour—one from Lockport lime rock, the other from Shelby lime rock—as sent by Messrs. Lomber, Wright, & Stoag, of Union Mills, Medina, to fertilize.

Half ton rice meal, from Messrs. Ross, Hall, & Co., Mount Royal Mills, Montreal, to test against other grains in fattening cattle.

Essex boar, from James Anderson, of Puslinch.

West Highland bull, from Geo. Whitfield, of Rougemont, Quebec.

Jersey grade heifer-calf, twin with a bull—supposed to be a "Free Martin"—from W. F. Beadle, of St. Catharines.

Samples of plants and soils, from John Turner, ex-student, late of Hamilton—now of Edmonton, Manitoba—for museum.

And it is my duty, and a particular pleasure, to acknowledge the constant, energetic, faithful, and efficient services of the following gentlemen :—

P. J. Woods, Farm Foreman; James Forsyth, Horticultural Foreman; James McIntosh, Mechanical Foreman. It is now a matter of no longer delay that these gentlemen receive full remuneration for their services; they get no perquisites or allowances whatever, and, as they can command more elsewhere, it is surely but fair to pay for what we get. The responsibility and educational requirements of their respective offices well demand an increase of salary. To this I beg the prompt attention of the Government.

As also of James Stock, Student Instructor; S. H. Shuttleworth, Assistant Superintendent of Experimental Department; Archibald Parker, Shepherd; E. H. Barclay, Cattleman.

And, as much of our success lies with student help, I take great pleasure in naming James Duthie, Guelph—now of Manitoba—for experimental help in cattle fattening; W. Gilpin, Ottawa, for bull management; W. Monteith, Huron, for bull management; H. Raikes, Barrie, for superintendence of fencing; W. H. De Veber, St. John, N. B., for experimental help in cattle fattening; A. McIntosh, Guelph, for experimental help in cattle fattening; W. F. Creelman, Collingwood, for assistance in mechanical department; J. Robinson, St. Thomas, for help in fattening experimental cattle; C. H. McNish, Lyn, for milk testing experiments; and D. McClennan, Glengarry, for experimental sheep feeding.

IV.—Cattle already on Hand for 1883 Sale.

Shorthorns—

Bull out of Beta, imported at a cost of $1,400, by Socrates of Hunter's herd, Alma, Ontario.
Heifer out of Louan of Brant 5th, by Prince Hopewell.
Heifer out of Cambridge 10th, by Baron Berkely of the Stone herd, Guelph.

Aberdeen Polls—

Bull out of Eyebright, by Gladiolus.
Bull out of Sybil's Darling 2nd, by Meldrum.
Heifer out of Leochell Lass 4th, by Gladiolus.
Heifer out of Haughton Lass, by Meldrum.

Herefords—

Heifer out of Heatherhill, by Hopedale.
Heifer out of Princess Louise, by Hopedale.
Heifer out of Princess Mary 2nd, by Hopedale.

Ayrshires—

Bull out of Juno 2nd of Drumlanrig, by Stonecalsey.
Bull out of Flora 3rd of Drumlanrig, by Stonecalsey.
Heifer out of Beauty of Drumlanrig, by Stonecalsey.

V.—Our Fat Cattle and Sheep at Exhibitions.

As reported to you in our experimental advance issue of June last we exhibited a pen of thirteen fat shearling wethers of the various grades specified, and five head of cattle—one heifer and four steers. They were not put in competition, as being the best policy in our circumstances. That they were favourably commented upon is not saying too much, and the following card that accompanied them seemed to meet every kind of enquiry:—

Four Steers, as Specimens for Exportation, not in Competition.

Breed—Grade Shorthorns, two-thirds bred.
Age—Average, 920 days—$2\frac{1}{2}$ years.
Weight—"Chancellor," 1,680lb; "Champion," 1,530lb; "Commander," 1,605lb; "Conqueror," 1,595lb; average, 1,602lb.
Increase—1.73lb per head per day since birth.

Food—Daily for 324 days: Corn, peas, oats, in equal parts, 10lb; mangolds, turnips, for six months, 35lb; green fodder, for four months, 75lb; oil cake, for three months, 4lb; bran, 2lb; Thorley's food, $\frac{1}{4}$lb.
Cost of Production—Per head, $133.
Manure Value—Per head, for last twelve months, $55.
Present Value—Per head, $121.
Profit realized—Per head, $43.

Shorthorn Heifer, five years old on 17th September, 1882.

Weight, 1,905lb; increased $2\frac{1}{10}$lb per day during last seven months.
Experimental Feeding—Corn gave daily increase per head, 1.91lb; peas, 1.83 lb; oats, 1.60lb.

Twelve Fat Wethers, as Specimens for Exportation, not in Competition.

Breeds—First crosses of Leicester, Oxford Down, Shropshire Down, South Down, and Merino rams with Canadian ewes.
Age—Shearlings, 18 months.
Weights—Per head, average: pure bred Leicesters, 265lb; Leicester Grades, 220lb; Oxford Down Grades, 210lb; Shropshire Down Grades, 210lb; South Down Grades, 180lb; Merino Grades, 150lb.
Food—Peas, oats, bran, hay, green fodder, and oil cake.
Wool—Washed, per head: Cotswold Grade, 9lb, 22 cts.; Leicester Grade, 8lb, 22 cts.; Oxford Down Grade, 9lb, 28 cts.; Shropshire Down Grade, 8lb, 35 cts.; South Down Grade, 7lb, 35 cts.; Merino Grade, 6lb, 35 cts.

Balance Sheet.—Manure not Credited.

	Carcass.	Wool.	Cost.	Balance.
	$ c.	$ c.	$ c.	$ c.
Leicester Grade	11 00	1 76	8 10	4 66
Shropshire Down Grade	12 60	2 80	7 00	8 40
Oxford Down Grade	12 60	2 52	7 40	7 72
South Down Grade	11 70	2 45	6 00	8 15
Merino Grade	7 50	2 10	5 50	4 10

These catttle and sheep were almost faultless of their kind, and were specially interesting because everybody knew what was before them. The exact breeding, age in days, the food in quantity and cost, the weight of each, value of manure received, and the whole cost of production, with profits exactly in every item. It will be understood that the object of the experiment was not to produce the greatest weight of two-year-old steers *irrespective of cost*, but to do so with the ordinary kinds of food, and not by any pampering, as is very common now with molasses and other nic-nacks.

In November we gave Mr. Geo. Hood, of Guelph, a draft of six of these wethers to go to Chicago Fat Stock Show with others of his own. This draft was made up of:—

One Oxford Down,	2nd cross,	weighing	221 lbs.;	lambed	10th April, 1881.
One Oxford Down,	1st	"	214 lbs.;	"	15th April, "
One Shropshire,	1st	"	220 lbs.;	"	29th March, "
One Southdown,	1st	"	213 lbs.;	"	9th April, "
One Leicester,	1st	"	231 lbs.;	"	20th April, "
One Leicester,	pure bred,	"	307 lbs.;	"	25th March, "

Average weight................ 235 lbs.

They were named, ear labelled, weighed, and a regular pedigree of each forwarded, so that no question could arise in regard to their production. At such a competition as Chicago any prize, or commendation even, is considered a big thing, therefore, it affords me much pleasure to record that the

First Premium was awarded the Oxford Down, second cross,
First Premium to pure bred Leicester,
Third Premium to Oxford Down, first cross, and
Third Premium to Leicester, 1st cross.

In addition to these Mr. Hood obtained nine other premiums, including two sweepstakes, and brought to Ontario one-third of the whole of the blue ribbons for sheep.

At Guelph Christmas Fat Stock Show the cattle were on exhibition, and for sale. They were purchased by Messrs. Franklin & Mallon, of Toronto, at an average of ten and one-half cents per pound, live weight. Weights were :—

Shorthorn heifer, five years and three months old........	1,950 pounds.
Shorthorn grade steers, average 995 days old	1,800 "
	1,700 "
	1,680 "
	1,650 "
Average......................	1,756 pounds.

Two of these steers were bred by Mr. Rae, of Eramosa, and one by Mr. Black, of Fergus. Permit the following excerpt from the notice of the two enterprising and public spirited citizens of Toronto :—

"Ex-Ald. John Mallon and G. F. Frankland have purchased in Guelph, for a Christmas display, the four steers and Shorthorn heifer from the Ontario Experimental Farm, which were exhibited both in Toronto and Kingston during the past fall. They were not in competition, but were exhibited as specimen cattle for exportation.

"The four steers, named Chanceller, Champion, Commander, and Conqueror, had attained the great weight of 1702 lbs. average, showing beyond doubt that cattle averaging two and a half years old weighing such a weight demonstrates clearly that early maturity should be more studied than it is.

"Messrs. Mallon and Frankland will have accomplished their purpose in this large outlay and expense if our farmers will read and understand that by following the practical theories of Professor Brown in regard to early maturity, millions of dollars will be added to the wealth of the farmers of Ontario, and give us cattle for export second to none in the world."

The Special Live Stock Class at College.

As this Institution grew, year by year, it developed some things in farming more prominently than others ; among these has been the Live Stock interest. One of the very first cares of the Government was providing good samples of the more important breeds of cattle and sheep for student instruction. With such appliances we have not neglected practical application, and no young man who has been with us can say that he has not had every opportunity of making a very intimate acquaintance with cattle and sheep in all their practical bearings. Gradually, as we worked up this subject, there came enquiries of special import with reference to breeds of cattle and sheep suitable for the various conditions of our continent—enquiries regarding their conduct in our hands, and specially, enquiries as to whether the subject of live stock would be taught separately. At length the applications for the establishment of a "special live stock class" became so numerous that last spring you advised the opening of one, experimentally meantime, until experience should justify its permanency on the curriculum of the College. You will recall your own full personal explanation of this subject to the students in October last, immediately after which the class was opened. The number was limited to twenty, and out of thirty applications twenty are now in full study. I have no doubt President Mills will indicate in his report what this class does when under his charge in the College—what they are doing outside is mine to explain : Coming out morning, or noon, as the case is, alternate weeks, the class is made into two equal divisions—one for cattle, the other for sheep, alternating daily. During the first hour the duty of each is to make an accurate inspection of the herd or flock, with the cattle-man and shepherd, in order to ascertain if anything requires immediate attention—such as disease, calving, etc.,—to note the same in their diaries, assist in any such attendance and generally make themselves acquainted with the condition of every animal. During the second hour, those on cattle receive practical lessons from the farm foreman, in judging, handling, and comparing breeds, and individuals, with special reference to beefing properties, and as Mr. Woods is also well up in marketing and the butcher's view of a carcass, the class obtain some excellent practice in cutting up the College beef, mutton, and pork. In addition, the classes as required attend any special case of live stock enquiry, as occurs pretty often among so many breeds, and no doubt when lambing season opens their time will be very fully occupied, day and night. The last hour is devoted in assisting to feed and make up for the night. Professor Grenside, has often occasion to take this class to outside practice with horses as well as cattle and sheep, so that altogether there exists no want of opportunities. All this is so arranged as not to interfere with the regular duties of the regular classes; were it to do so, much of our good name would suffer. These then, with all the lectures, and practical class-room work by Professor Grenside and myself, go to fill a bill of plenty variety and substance. But there are also hours of study, when text-book reading and the extension of the diary, are placed as part of examination subjects. I may add that all our experimental feeding is also brought under the daily notice of this class.

The particular object of this special live-stock class is to fit young men, who have in view the breeding of thoroughbreds, the investment in ranche and runs, for themselves, and as managers of any of these for others.

The progress, to date, 15th Dec., is very satisfactory indeed. Business is marked in all the conduct of the class, and, as we have your instructions to be liberal and very firm with every individual, I trust you will hear of an unusually good record next Easter.

The present class is made up of one-third Europeans and two-thirds Canadians.

We use as a text-book, "Dr. Manning's Stock Doctor, and Live Stock Encyclopedia,' as published by *The World* Publishing Co., Guelph.

AMERICAN FORESTRY.

Two words meaning much—how much no one at present alive will ever realize, and this is what strikes at the root of man's indifference on the subject, that is, that he cannot himself personally hope to receive all the benefits from the conservation of the present trees, and particularly from replanting. American returns must be smart, strong and undoubted ; the idea of permanency in the long after years does not concern us so much as *now ;* we are fond enough of speculating upon cause and effect, and, in this matter, delight in big talk, that indeed does not lack for as much soundness as Europe can produce, but it is talk largely only. Let us add to this phase of our life by submitting some thoughts on such an important subject, with the hope that we are not far off from acting up to what is preached.

The General Importance of Forestry in North America.

It is the experience of the world that more difficulty, in all its forms, is found in reclothing with trees where trees grew before, than it is to plant—not replant—a country for the first time. There is not only the practical fact of succession of cropping in its scientific and natural bearings as similarly realized, for example, in the the products of the farm, but the more serious one of the indifference of its population. It is just a piece of human nature everywhere, that what has been felt as common and every body's property, is no one's particular business when remedies are asked for in the exigencies of public affairs.

By Forestry is meant the whole science and practice of arboriculture ; the conserving, the care-taking, preservation and proper management of existing trees, and the replanting of land for purposes now to be discussed. Speaking generally we are, and we are not, deeply concerned, as a nation, in the more modern views of forestry. In Europe it takes a shape that may never be realized here, because of one thing—that one thing is large proprietory, the possessing within *one man's* power all the area and class of soil suitable to profitable production on a large scale, so that even that one man can employ officers and men in such numbers as make profits certain. Cultivated America meantime is so subdivided as to effectually preclude all idea of sufficient massing of woods to receive equal results with Europe—but the day may come. Though not thus situated for forest culture, we are otherwise obliged to give it a place in our rural economy. It is especially applicable to any country that has been a forest by nature, where in some things nature has been unthinkingly trampled upon, and where agricultural progress now demands the aid of her sister science—arboriculture. We are not singular in these matters, and can sympathise with

What is being done in the Conservation and Re-planting of Forests in other Countries.

There is no country whatever that has made its agricultural history and does not now complain of want of trees. India, Australia, Europe and the United States, all tell their story of overclearance, of the need of conserving, and of the necessity of replanting. Their greater years than ours has given experience that should encourage, and dismiss all doubts on our part. The effects of judicious re-clothing are already subjects of congratulation, and of yearly revenue in competition with agriculture, so much so indeed with some that the other is not uncommon talk with proprietors. India has her standing army of foresters, trained to all cunning in sylvan matters, at European schools; Australia can already boast of its "Forest Board,"—its conservator of forests, tree nurseries, extensive enclosures planted and to be planted, and a whole system of arboriculture of the most encouraging kind, and the United States, though doing more talk than spade work, are unquestionably on the very margin of a revolution, they have not gone through the forest without "seeing some firewood."

The Objects of Conserving and Replanting are not a few.

Most people think of trees, first of all, as means of shelter—under several forms. We like shelter for buildings, shade for ourselves, shelter and shade for animals in the field, and shelter for farm crops. These alone would make up a large value in any district where required, and would justify all the cost and subsequent attendance. Yet, we have another aspect of the question that takes an equally strong place in our regard: *Climate* is not alone a matter of great outside causes, but one intimately related to local influences, among which trees are pre-eminent. We have no time to show how temperature, rain-fall, moisture, and evaporation are directly influenced by a small or large surface of trees—how therefore water in every form is in the hands of trees for local distribution. This second duty of forestry as a science and practice would even seem to swallow up the previous question, and are consequently inducements alone to its prosecution on our part. Were neither of these sufficient, however, to convince, the third great reason for tree cultivation will surely convert even the most stiff-necked among us. It is no matter of doubt, under average conditions, in any country, that tree culture is more profitable as a crop than its own agriculture, year by year. This position is not open to question, but clear and marked in all experience where age has given time for proof. And lastly, some men are satisfied when large expenditure secures what to them is all in all—ornament; and assuredly ornament is value. Who would not give $500 more for a farm where the buildings are set off by just the kind, number, and proper position of trees and tree clumps?

The Area of Land in North America

is not an unknown thing. There is no case in Europe as regards *small propriety*, having recently occupied a forest country, and where extensive clearing took place for agricultural development. But it is not true that the American continent is now poorly wooded in comparison with other countries; the United States can show twenty-five, and Canada fifty per cent. of the cultivated districts, as still under trees. This is possibly larger than any other continent, if we except the northern part of Europe, where agriculture is necessarily at a discount, and where forest is practically untouched. What then is the cause of our discontent? if on an average, *one-third* of populated North America is still under forest, why do we advocate conserving and replanting? or, in other words, what are

The Requisite Proportions of Tree Surface to that under Agricultural Crops?

This is just one of the things that we do not know, and that we are not likely ever to know as a point for general practical guidance. The conditions affecting climate are so various as affected by latitude, altitude, aspect, soil, sea or lake neighbourhood, and vegetation, that no possible number of observations, in any length of time, could say how much for one district is so much for another. However, men do come to realize through science and practice—practice especially—that a farm, or a district, needs the protection in certain places, and thus by such a simple guidance alone, a country could easily be reclothed to the extent required, at least for shelter, if not for regulation of climate, or of sufficient area as a cropping investment; this point of immediate shelter is, therefore, within everybody's knowledge, and needs no scientific recognition, and should not require any governmental spurring. But the greater field of climate, as an unknown one practically in this relation, is more a national problem, and still very much a scientific enquiry, and what it will have to say in regard to the proportion of trees to farm crops no one can tell. Of course, if we disregard everything but the direct profits from trees as a crop upon land, then we shall likely override all other deductions, and possibly bring back the days of laziness and unhealth. Viewing trees in all their relations, I am of opinion that upon an average of conditions in Ontario—one-fourth of the land should be under trees, and as this is just double what we have at present, there rests the apparent inconsistency of wanting to conserve and replant, all the while that we have double what is needed. This brings out the fact that it is the *irregular distribution* of tree surface in our case which gives trouble, that some parts have more than required, and others have been over-cleared. So then

The Existing Condition of our Forests

is the very first consideration in this enquiry. What is the condition of all our woodlands, both in the older and newer townships at the present moment, and what should be done with them in order to their best maintenance—such a maintenance as shall secure annual revenue, shelter, and climatic amelioration along with the due agricultural development?

Outside of the lumbering interest there is no enclosing, preserving, caretaking, or conserving in any sense, except the right of individual ownership, some of whom do act the forester, but nationally there is nothing recognized, and hence waste. The average bush of North America is a beautiful sight, and yet a sad one. The artist must revel in its variety of form, and foilage, but the fighting for place, the scraggy monarch of three hundred years, smothering even as he dies, scores of plants that but for him would attain to value; the general want of light and air, and otherwise a decay and loss, recognized only by those who are scientifically and practically foresters. I do not mean that our forests in every case should be managed similarly to those in Europe, because much of our best timber requires very different conditions, but similar principles ought to guide our management. While then, we owe a steady eye to progressive judicious replanting, it is above all others our first duty to manage well what we do possess. It will be the cheapest, the most rapid, and the most sure method of re-adjusting matters—along, no doubt, with a certain replanting of cleared land. No fear need exist in regard to

The Adaptability of Soils and Climate to Rapid Results,

for nature herself has already shown us what to do both in repeating the same kind of crops, and in the proper rotation of trees, by sections of the country. But that nature has been the best guide in most things is not admitted. We cannot follow her in mode of thinning out so many annually, in making branchless stems, and therefore leafless and shelterless trees, comparatively. It is sound in practice, though not in theory, that ten trees, of certain kinds, standing within a given area, will afford less shelter, less wind break, than three trees of exactly the same sort, properly managed on the like area. We have soils and climates wherewith to do almost anything in tree life—from the pine of the north, which luxuriates in an apparently bare rock cleft, to the walnut of the south, that must send its carroty root several feet into a rich soil. European forest revenue begins, as an average, fifteen years after planting; that of America ten years afterwards.

As the subject grows upon our attention, we are next concerned with

What Parts of the Country Should be Conserved or Replanted.

And in this part of the study it is obvious that our views cannot be confined to single farms, or even special sections. Referring, as we must, to the great over-ruling influences, as previously indicated, we have to deal with geographical features that may embrace thousands of acres that have to be subserved by one, or more, massing of trees. Just where to conserve or replant, how much on the spot, or spots, in what particular form—belt, clump, or block—and with what kinds of trees, so as to gather and dispense all the virtues that trees are known to possess, is the great problem of the future. To say that we should replant only our less valuable soils is nonsense, though sensible enough from the cultivated standpoint; that high lands should be conserved or reclad as against lower parts is largely true, though not generally applicable, and that conserving and replanting must go hand in hand, and take place anywhere as found necessary though experience, is correct in every sense.

Following this view of the subject there is naturally that of

Suitability of Certain Kinds and Forms of Trees for Special Purposes,

Whether for neighbourhood of dwellings, road-side shade, shelter-belts, field clumps, or for more extensive planting, efficiency and permanacy in every example are the primary considerations. It is not difficult, because experience is extensive, to decide on those species of trees for roadside, and house shelter, but much has not been done for the others, and so some advice will not be out of place.

To attain all the objects desired in replanting it is obvious that many varieties together in one clump or plantation would be indispensable: early shelter and rapid returns for the money invested would be best secured by certain kinds of trees more than others; such trees would also serve as nurses to others, and permanency in their case would not be wanted, but we would desire in their character a full and spreading foliage coming early and remaining late in the season, or even throughout the winter, to attain size in ten or fifteen years, and to be of a quality that would fetch a handsome revenue per acre for the period since planting. The removal of these gradually from the plantation as required by the progress of the other sorts would form, as it does now in other countries, a nice scientific and practical study. The second class of trees in such a plantation should be of a less spreading habit and more of upright growth so as not to interfere too early with the first and third classes; they should also begin to offer some revenue at thirty years, because the most of them would have to give place to the third or standard class, in about fifty years from the date of planting. In all well regulated planting one set of trees is held as those to remain as long as good management, their own natural habits, and a proper time to harvest without loss, will allow. These are the third class referred to, and necessarily we desire a slower growth, a habit that will not spoil by close neighbourhood—a sociable plant therefore, giving high value when cut, maturing late, holding its maturity long, giving low branches and many leaves, a gatherer and holder of atmospheric moisture, a wind sifter, and holding electric communication with cloud and other trees at a distance. We have such trees of several varieties.

The preparation of the land, detailed method of planting, distance apart of trees, including fencing, drainage, knowledge of enemies and friends in nature, and all the management throughout in order to attain the highest results are too much for my time on this occasion.

The farmer's view of a wood, is grazing. Modern Arboriculture does not recommend it in Europe at any stage of growth, yet, with us in the more difficult maintenance of permanent pasture, I see no objection to the admission of sheep during the second, and cattle during the late cropping periods.

The duty of legislatures, in regard to existing woodlands, and replanting, is being pressed upon our attention from various quarters, and unquestionably ere long every progressive country must take some action. How much to do, and what not to interfere with, will make the bill. That the Ontario Government has a warm side to trees is well known, and it is to be hoped that whatever they do will be early, full, good, rapid, and permanent.

American Forestry will have no place in all its scientific and practical value until one of two things be accomplished: one is the conviction on the part of our farmers, of the necessity of conserving and replanting, therefore their education up to these, and the other is the power by Government to resume parts of the country for conserving and replanting. Both will be difficult; the former would be the slower, but eventually the most thorough because of self-interest; the latter would be more immediate and possibly less efficient, practically, though scientifically better applied. No large number of various interests could be so well arranged as by a company, and therefore Government will have to become foresters in all the many details of the profession. Were a properly conducted system of forestry begun in 1884, the results would be so strong in the year 1900 as to astonish. It would possibly change much of our present agricultural practice, it would certainly enhance the production of winter wheat to an immense extent; it would enable us to graze nearly two for one by checking rapid evaporation and encouraging permanent pasture; it would largely nullify droughts, perpetuate streams, and generally make climate more regular and reliable.

To those acquainted with Arboriculture as a profession in all its national bearings, an annual expenditure of $50,000 has in other countries made an *annual* crop revenue of $25,000 within fifteen years, in addition to the *triple* value of climatic amelioration.

Concluding Remarks.

In concluding our Eighth Annual Report, I think it is perfectly in place to express regret at your own retirement from political life, and particularly the change it will make with the Agricultural College and Experimental Farm. Your open, liberal, strict, and impartial management of all our concerns has given much satisfaction, and though "out of office" it is to be hoped you will always be interested in our welfare.

There is no Government appointment so intimately associated with the well-being of so many in any country as that of Commissioner of Agriculture—none so honourable, and certainly none requiring so much aptness, because of its immense constituency as well as the yearly breaking of new ground. Our College history and that of all other Agricultural Colleges stands as an example of these: Designed for the benefit of farmers, they have had to bear the brunt of all their uncharity, prejudice, and even jealousy. Few, how very few, have said "Let us help the Government to make this the best Agricultural College and Experimental Farm in the world; it is ours, and as it is something new, really an experiment, we shall give it the very best charity and unprejudiced support, free of all jealousy." Now, at the present moment, our Institution is acknowledged by the world, as one of the best if not the best of its kind, and as you know, this has been attained, not by the self-interested support of farmers, but by the unflinching purpose of its originators and management. I could very easily name to you how many of our visitors have said, "Well done so far, try and do better next time." I have named uncharity and prejudice, the former is a very common item anywhere, the other can be got over as time advances, but that jealousy which is the apprehension of superiority is likely to be our black beast for some time longer.

The farmers of Ontario should determine now to place their Agricultural College and Experimental Farm the highest that science and practice can possibly do.

I have the honour to be, Sir,

Your obedient servant,

W. Brown,

Professor of Agriculture, Farm Manager, and Experimental Superintendent.

APPENDIX.

INVENTORY AND VALUATION OF LIVE STOCK AND IMPLEMENTS ON HAND, 1st DECEMBER, 1882.

Horses.

13	Working horses		$1,800 00

Cattle.

1	Shorthorn bull	$500 00	
5	" cows	1,300 00	
3	" calves	300 00	
1	Hereford bull	800 00	
3	" cows	1,000 00	
2	" calves	200 00	
1	Aberdeen Poll bull	1,000 00	
2	" " cows	2,000 00	
4	" " calves	500 00	
1	Ayrshire bull	200 00	
4	" cows	300 00	
3	" calves	150 00	
1	Devon bull	200 00	
1	" cow	100 00	
1	Jersey cow	300 00	
1	West Highland bull	100 00	
34	Total value of thoroughbred cattle		$8,950 00
11	Shorthorn grade cows	$500 00	
9	" " calves	100 00	
2	Ayrshire grade cows	70 00	
1	Aberdeen Poll grade cow	100 00	
1	" " " calf	50 00	
1	Hereford grade steer calf	20 00	
1	Jersey grade heifer calf	10 00	
4	Canadian cows	170 00	
17	Fattening steers of five grades	650 00	
81	Head in all		$1,670 00
	Total value of cattle		$10,620 00

Sheep.

28	Cotswold ewes	$800 00	
22	Southdown ewes	850 00	
12	Leicester ewes	350 00	
10	Oxford Down ewes	500 00	
12	Shropshire ewes	700 00	
84			
36	Lambs, of kinds	700 00	
8	Stock rams, of six breeds	1,300 00	
128	Thoroughbreds		
15	Grade ewes	150 00	
40	Fattening wethers	350 00	
183	head. Total value of sheep		$5,700 00

SWINE.

3 Boars, Berkshire, Essex, and Poland China	200 00	
4 Brood sows	300 00	
3 Scotch Collie dogs	50 00	
		$550 00
Total value of Live Stock		$18,670 00
Value of farm implements, per Inventory	$3,900 00	
" of garden implements, per Inventory	1,250 00	
" of mechanical tools, per Inventory	480 00	
" of implements in Experimental Department	250 00	$5,880 00
		$24,550 00

PART VII.

REPORT

ON

HORTICULTURE AND ARBORICULTURE.

To the Honourable the Commissioner of Agriculture:

SIR,—It becomes my duty this year to report, however briefly, on the practical horticultural work of this Institution, and in this particular I fear the department will not receive the justice it has hitherto done at the hands of Professor Brown, who, in consequence of his many other duties, has been relieved of the direct charge; but, although he has ceased to take an active part in the working of the department, I hope he will when required, continue to give that friendly advice and direction which he has always so readily given and which he is so capable of bestowing.

As a general observation I would say that we have now come to the close of a very busy season. The additional time and labour spent on extra work, spring planting, etc., somewhat retarded other operations. Considering the increased area now attached to the department—including arboretum, vineyard, orchard, and small fruits, as well as kitchen and flower garden, in all comprising over fifty acres—it was no easy matter, with the class of labour at our disposal, to accomplish the work in its proper season. Indeed, it was not until the cropping season was over that we were able to get the work into anything like desirable shape. The general result has, however, been very satisfactory. In the kitchen garden all the ordinary classes of vegetables were produced in abundance, and the staple varieties, such as potatoes, cabbage, peas, beans, tomatoes, celery, and roots were much in excess of the average crop.

In the flower garden we have now a very good assortment of bedding or half-hardy plants, and their general appearance, due to the copious and seasonable showers throughout the summer, was all that could be desired. The plants growing luxuriously and blooming freely from June to the middle of October, and sufficient stock is now secured to propagate from, according to our room and convenience, for next year. We have still a very limited collection of hardy herbaceous or border plants, but hope to have it increased during the coming season by some of the less common but more choice varieties.

ARBORETUM.

In 1880, under the direction of the Fruit Growers' Association of Ontario, an Arboretum was commenced in which it was intended to have at least a single specimen of all the trees or shrubs, native or exotic, that were thought at all likely to stand our climate. The ground was selected comprising about two and a-half acres on the western front of the College buildings, partly sheltered on the western and northern sides by a close line of native spruce, some years established. About sixty different species and varieties of deciduous and evergreen trees and shrubs were planted and did well for the summer, but the unusually severe winter of 1880-1 caused quite a few vacancies which in the spring of 1881 were replaced and a very large addition made.

The following list shows those which have stood one winter, and have now the growth of two seasons :—

Deciduous Trees.

Acer saccharinum, sugar maple.
" colchicum rubrum, scarlet maple.
" Nances var. maple.
" oregoni, Oregon maple.
" pseudo platanuus, sycamore
" platanoides, Norway maple
" spicatum.
" striatum, striped-barked maple
" Tartaricum. Tartarian "
Acacia julibrissin, Mimosa tree.
Alnus glutinosa, common alder.
" laciniata, cut-leaved alder.
" maritima, sea side "
Anona triloba, pawpaw tree.
Aralia spinosa, thorny aralia.
" japonica, Japanese aralia.
Amelanchier botryapium, June berry.
Ailantus glandulosa, celestial tree.
" Chinensis, Chinese variety.
Æsculus hippocastanum, horse chestnut
" glabra, smooth "
" flava, yellow "
Betula lenta, sweet birch.
" populifolia, poplar-leaved birch.
" rubra, red " "
" papyracea, paper birch.
" lutea, yellow "
" alba purpurea, purple-leaved birch.
Castanea vesca, Spanish chestnut.
Catalpa bignonoides, trumpet flowered catalpa.
" nana, dwarf catalpa.
" speciosa, showy catalpa.
Carya alba, shell-bark hickory.
" amara, bitter-nut "
" aquatica, swamp "
" microcarpa, small-fruited hickory.
" olivæformis, Pecan-nut "
" porcina, hog-nut "
" sulcata, furrowed "
" tomentosa, woolly "
Celtis occidentalis, American nettle tree.
" Australis, European " "
" pumila, dwarf " "
Cercis Canadensis, American Judas tree.
" siliquastrum, European " "
Cerasus Padus, bird cherry.
" Virginiana, Virginian cherry.
" flora pleno, double flowering cherry.
" carnea pleno, double flesh-coloured cherry.
" ranunculæ flora, ranunculus flowered cherry.

Fagus Americana, American beech.
" sylvatica, European "
" purpurea, purple-leaved beech.
Fraxinus Americana, white ash.
" platycarpa, broad-fruited ash.
" sambucifolia, black "
" quadrangulata, blue "
" juglandifolia, walnut-leaved ash.
" excelsior, taller ash.
" " aucubæfolia.
" " jaspidea, yellow-barked ash.
" " heterophylla, various-leaved ash.
" " salicifolia, willow-leaved ash.
" " spectabilis, variegated ash.
" " Theophrasti.
Gleditschia horrida, strong-spined honey locust.
" . triacanthos, three-thorned honey locust.
Gymnocladus canadensis, Kentucky coffee tree.
Juglans nigra, black walnut.
" cinerea, butternut.
Kolreuteria paniculata, panicled kolreuteria.
Laurus sassafras, sassafras tree.
" benzoin, Benjamin "
Liquidambar styraciflua, sweet gum.
Liriodendron tulipifera, tulip tree.
" integrifolia, entire-leaved var.
Magnolia acuminata, cucumber tree.
" glauca, swamp cucumber tree.
Nyssa multiflora, sour gum.
Negundo fraxinæfolium, ash-leaved maple.
Ostrya Virginica, ironwood.
Platanus orientalis, oriental plane tree.
" occidentalis, western plane tree.
Paulownia imperialis, Empress tree.
Pyrus laciniata, cut-leaved service tree.
" aucuparia, mountain ash.
Populus alba, abele tree.
" monilifera, necklace-bearing poplar.
" angulata, Carolina "
" angustifolia, narrow-leaved "
" Empress Eugene "
Quercus aquatica, swamp oak.
" alba, white "
" bicolor, two-coloured "
" Bannisteri, Bannister's oak.

DECIDUOUS TREES—*Continued.*

Quercus cinerea, ash-coloured oak.
“ coccinea, scarlet “ “
“ imbricata, tiled “
“ lyrata, swamp-post “
“ macrocarpa, long-fruited oak.
“ nigra, black Jack “
“ obtusiloba, post “
“ palustrus, marsh “
“ prinus, prince's chestnut “
“ rubra, red “ “
“ rubur, sessil-fruited “
“ tinctoria, dyer's “
Salix caprea, Kilmarnock willow.
“ annularis, ring-leaved “
“ candida, white “
“ discolor, two-coloured “
“ Forbyana, Forby's var. “
“ Japonica, Japanese “
“ myricoides, gale-like “
“ pentandra, bay-leaved “
“ rex, royal “
“ purpurea, purple “
“ Russelliana, Russell's “
Salix rosmarinefolia, rosemary-leaved willow.
“ salmoni.
“ Villarsiana, Villar's variety willow.
“ vitellina, yellow-branched “
“ alba, common white “
Salisburia adiantifolia, maiden-hair tree.
Staphylea trifolea, bladder-nut tree.
Sophora japonica, Japanese Sophora.
Tamarix tetranda, tamarisk.
Taxodium distichum, deciduous cypress.
“ Chinensis, Chinese “
“ pendula, new weeping “
Tilia Europæa, linden.
“ Americana, basswood.
“ heterophylla, various-leaved,
Ulmus pyramidalis, lofty elm.
“ montana, mountain elm.
“ fastigiata, peaked “
“ purpurea, purple-leaved elm.
Zanthoxylon fraxineum, ash-like toothache tree.

SHRUBS.

Andromeda Mariana, Maryland andromeda.
“ arborea, tree-like andromeda.
“ racemosa, branchy andromeda.
Amelanchier nana, medlar tree.
Amygdalis nana, dwarf-rose almond.
“ alba, dwarf-white almond.
Azalea viscosa, clammy Azalea.
Berberis vulgaris, common barberry.
“ purpurea, purple-leaved barberry.
Callicarpa purpurea, purple-leaved calicarpa
Ceanothus Americana, American red-wood.
Calycanthus floridus, florid allspice.
Cerasus pumila, dwarf cherry.
Cephalanthus occidentalis, western button-wood.
Chionanthus Virginica, white fringe.
Clethra alnifolia, alder-leaved clethra.
Cotoneaster baccilaris, cotoneaster.
“ floribunda, many-flowered cotoneaster.
“ obluta.
“ accuminata, pointed cotoneaster
“ frigida, frigid cotoneaster.
“ buxifolia, box-leaved cotoneaster.
Corylus avellana, filbert.
“ purpurea, purple cob-nut.
Colutea arborescens, bladder senna.
Cornus alba, white dogwood.
“ alternifolia, alternate-leaved dog wood.
“ florida, flowery dog-wood.
“ mascula, male-cornel dogwood.
“ paniculata, panicled dog-wood.
“ sericia, silky dogwood.
“ sanguinea, bloody dogwood.
“ stricta, upright dogwood.
Cratægus oxyacantha, hawthorn.
“ “ variegata, var. hawthorn.
“ “ rubra splendens, red hawthorn.
“ “ Douglasii, Douglass hawthorn.
“ crus-galli, cockspur thorn.
“ apiifolia, parsley-leaved thorn.
“ cordata, heart-leaved thorn.
“ Paul's scarlet thorn.
“ flava, yellow thorn.
Deutzia crenata, crenate Deutzia.
“ “ pride of Rochester Deutzia
“ florepleno, double flowering Deutzia
“ scabra, rough Deutzia.
“ fortuni, fortune's Deutzia.
“ gracilis, slender Deutzia.
Eleagnus flava, yellow oleaster.
“ parvifolius, silver-thorn oleaster.

SHRUBS—*Continued.*

Euonymus Europæus, burning bush.
" " variegata, var.
" Americana, Am. var.
Forsythia viridisima, golden bell.
" suspensa, drooping golden bell.
Hamamelis Virginica, witch hazel.
Halesia tetraptera, snow-drop tree.
" meehani, var.
Hibiscus syriacus, althea.
" alba, white althea.
" purpurea, purple althea.
" carnea, flesh colored althea.
" variegata, variegated althea.
" Lady Stanley var.
Hydrangea quercifolia, oak-leaved hydrangea.
Kerria Japonica, Japanese kerria.
" flavescens, scented kerria.
" kalmeanum, Kalum's kerria.
Hypericum ascyron, ascyron-like St. John's wort.
" prolificum, prolific St. John's wort.
Itea Virginica, Virginian itea.
Lonicera grandiflora, bush honeysuckle.
" orientalis, eastern honeysuckle.
" philomelæ.
" Siberica, Siberian honeysuckle.
" Tartarica, Tartarian honeysuckle.
" xylasteum, fly honeysuckle.
Ligustrum vulgare, common privet.
" buxifolia, box-leaved privet.
" myrtifolia, myrtle-leaved privet.
" ovalifolia, ovate-leaved privet.
" Stauntoni, Staunton's privet.
" Japonica, Japan privet.
Magnolia Soulangeana, Soulange's magnolia
Myrica cerifera, candleberry.
Pavia macrostachya, long-spiked pavia.
Philadelphus coronarius, garland mock orange.
" flore pleno, double flowering mock orange.
" Gordonianus, Gordon's mock orange.
" Columbianus, Columbian mock orange.
" tomentosus, woolly-leaved mock orange.
" zeyheri, var.
" keteleeri, var.
Prunus triloba, three-lobed plum.
" Americana, American plum.
" chicosa.
" umbellata.

Ptelia trifolia, shrubby treefoil.
Pyrus Japonica, Japan pear.
" variegata, variegated pear.
" malus pruno, plum-leaved crab.
" semipleno, semidouble.
" cardinalis.
" floribunda, many-flowered crab,
" Siberica, Siberian crab.
Rhus copallina, gum copal sumach.
" cotinus, Venetian sumach.
" glabra, smooth sumach.
" typhina, fever sumach.
" trilobata, three-lobed sumach.
Rhamnus catharticus, purging buckthorn.
" Carolinianus, Carolina buckthorn
" Frangula.
Ribes aureum, golden currant.
" utah, blue currant.
" nigra, black currant.
" lutea, yellow currant.
" floridum, florid currant.
" Gordonii, Gordon's currant.
" Sanguineum, blood-flowered currant.
Rosa rubiginosa, sweet briar.
" rugosa, rough briar.
Robina hispida, rose acacia.
Rubus flore pleno, double flowering bramble
Sambucus racemosa, racemosa elder.
" variegata, variegated elder.
Spiræa aurea, golden meadow sweet.
" Billardi, Billard's meadow sweet.
" carpinæfolia, horn-beam-leaved meadow sweet.
" callosa.
" callosa alba, white meadow sweet.
" crinata, crenat-leaved meadow sweet
" chamædrifolia, germander-leaved meadow sweet.
" Douglassi, Douglass's meadow sweet
" fortuni, fortune's meadow sweet.
" Indica, Indian meadow sweet.
" nobleana, noble meadow sweet.
" opulifolia, opulus-leaved meadow sweet.
" prunifolia, plum-leaved meadow sweet.
" regeliana.
" sorbifolia, sorbus-leaved meadow sweet.
" salicifolia, willow-leaved meadow sweet.
" semperflorens, ever-flowering meadow sweet.
" Thunbergi, Thunberg's meadow sweet.

SHRUBS—*Continued.*

Spiræa vaccinæfolia, whortleberry - leaved meadow sweet.
Syringa vulgaris, common lilac.
" vulgaris alba, white lilac.
" rubra insignis, red lilac.
" Dr. Stockhardt's lilac.
" vallettiana.
" purpurea flore pleno, double purple lilac.
" gloire de moulins.
" oblata.
" josikæa, deep-flowered lilac.
" Persica, Persian lilac.
" racemosus, branchy lilac.
" variegata, variegated lilac.
Vaccinium corymbosum, whortleberry.
Vitex agnus-castus, chaste tree.
Viburnum acerifolium, maple-leaved viburnum.
" lantanoides, lantana-like viburnum.
Viburnum lentago.
" nudum, naked viburnum.
" sterilis.
" oxycoccos, cranberry-like viburnum.
" prunifolium, sheepberry viburnum.
Wistaria magnifica, large wistaria.
" sinensis.
" alba, white wistaria.
" fontescens.
" multifuga.
" Japonica, Japanese wistaria.
Weigela rosea, rose-coloured weigela.
" amabilis.
" purpurea, purple weigela.
" variegata, variegated weigela.
" multiflora, many-flowered weigela.
" hortensis nivea.
" grœneweigenii.

EVERGREEN TREES AND SHRUBS.

Abies alba, white spruce.
" Canadensis, hemlock spruce.
" excelsa, Norway spruce.
" engelmani.
" menziesii.
Andromeda calyculata, small calyxed andromeda.
Akebia quinata.
Biota orientalis, Chinese arbor vitæ.
" aurea, golden arbor vitæ.
Buxus Handworthia, Handworth's box-wood.
" sempervirens, box-wood.
Euonymus radicans, spindle tree.
" variegata, variegated tree.
Genista scoparius, Scotch broom.
Ilex opaca, Japan holly.
Juniperus communis, common juniper.
" prostrata, trailing juniper.
" occidentalis, western juniper.
" sabina, common savin juniper.
" Suecica, Sweedish juniper.
" virginiana, red cedar.
Kalmia latifolia, broad-leaved Kalmia.
" angustfolia, narrow-leaved kalmia.
Mahonia aquifolia, holly-leaved mahonia.
Pinus Austriaca, Austrian pine.
" benthamiana.
" inops, Jersey pine.
" Lambertiana, Lambert's pine.
Pinus Laricio, Corsican pine.
" mugho, mugho pine.
" pumila, dwarf pine.
" pungens, pungent pine.
" pinaster, cluster pine.
" ponderosa, heavy-wooded pine.
" mites.
" rigida, rigid pine.
" strobus, Weymouth pine.
" sylvestris, Scotch pine.
Podocarpus Japonicus, Japan podocarpus.
Retinospora obtusa, blunt-leaved retinospora
" ericoides, heath-leaved retinospora.
" pisifera.
" squarrosa, spreading retinospora.
" plumosa, plum-like retinospora.
Thuja ericoides, heath-leaved arbor vitæ.
" gigantea, large arbor vitæ.
" globosa, globe-shaped.
" spiralis.
" George Peabody var. arbor vitæ.
" glauca.
" pumila, dwarf arbor vitæ.
" pyramidalis, tall arbor vitæ.
" Siberica, Siberian arbor vitæ.
" tartaricum, Tartarian arbor vitæ
Taxus Canadensis, American yew-tree.

At the origin of the Institution, the approaches to and roads in front of the buildings were but roughly formed, and the lawn laid down with the ground, very much in its natural, uneven state, and not in keeping with the proportions and architectural appearance the buildings have since assumed.

Early last spring the matter was taken up, plans procured and approved by the Government, the work was commenced in the Fall, and considerable progress has been made.

To admit of the grading required, it was found necessary to lift the whole arboretum, which has been done with the greatest possible care, and the plants laid in and protected in a sheltered border until the coming spring, when they may, as intended, and as provided for in the plan, be replanted into fresh ground, arranged in groups according to their respective families, or natural orders, and correctly labelled, which I think will be all that can be desired for educational purposes, interesting to visitors, and I trust a credit to the Province.

Orchard.

The old fruit trees to the south and west of the College, from the building and other changes going on in the grounds, have been greatly reduced in number and, in carrying out the adopted plan of improvements, the remainder will soon have to be removed. In the spring, up to the season of flowering, there was every prospect of an abundant crop, but, in common with most orchards throughout the Province, suffered from a blight to such an extent that only about thirty barrels of very indifferent fruit was secured.

The young orchard selected and commenced two years ago, under the supervision of a Committee of the Fruit Growers' Society, now extended to over seventeen acres, about three acres of which are planted with small fruits between the rows of the larger trees, has done well, and made good growth last summer, the failures in last year's planting not exceeding two per cent., apart from a few causalties incident to cultivation. It is intended to have all the vacancies filled up in the spring.

The following is a complete list of what the Orchard now contains, with the number of each variety :—

Apples.

Varieties.	NO.	*Varieties.*	NO.
Roxbury Russet	8	Peck's Pleasant	5
Rhode Island Greening	20	Vandevere	5
Grime's Golden Russet	15	Shiawassee Beauty	10
Wagener	19	Duchess of Oldenburg	25
Yellow Bellflower	20	Gravenstein	25
Swaar	10	Alexander	10
Pomme Royal	20	Chicago	10
Baldwin	21	Fall Pippin	10
Northern Spy	50	Blenheim Orange	8
Golden Russet	25	Maiden's Blush	5
American Golden Russet	25	Hathornden	20
S. Pomme Grise	25	Newton Pippin	2
English Russet	5	Melon	10
Stott's Russet	6	Early Harvest	10
Fameuse	10	St. Lawrence	20
King of Tomkins County	10	Red Astracan	10
Talman's Sweet	30	Keswick Codlin	10
Ribston Pippin	20	Benoni	9
Twenty Ounce	10	Sweet Bough	5
Seek no Further	5	Haas	2
Mann	10	Bottle Greening	2
Beauty of Kent	5	Fallawater	2
Bailey's Sweet	5	Canada Reinette	2

APPLES—*Continued.*

Varieties.	NO.	*Varieties.*	NO
Porter	2	Andrew's Favourite	2
Jonathan	2	Clark's Orange Pippin	2
Baxter	2	Burbank's Bellflower	2
Perry Russett	2	White Pippin	2
Willow Twig	2	Early Strawberry	2
Walbridge	2	S. Pomme Grise	6
Mere de Menage	2	Spitzenburg	5
William's Favourite	2	Lady Apple	2
Smith's Cider	2	Ontario	12
Marquis of Lorne	2	Beauty	12
Monmouth Pippin	2	Ella	12
Tetofsky	2	Wealthy	2
Ohio Nonpareil	2	Ben. Davis	16
Red Canada	2	Mother	2
Lord Burleigh	2	Pawaukee	2
Clapp's Mammoth	2	Rambo	2
Lady Henniker	2	Lady Sweet	4
Baxter's Red	2	Belbourdoska	1
New Hathornden	2	Clermont	1
Irish Peach	2	Dora	12
Jefferson	2	K. Codlin	2
Flushing Spitzenburg	2	Montreal Crab	1
Chebucto Beauty	2	Hyslop Crab	1
Calkins Pippin	2	Transcendent Crab	1
Cox's Orange Pippin	2	Marengo Crab	1
Lord Derby	2	Van Wyck Crab	1
Bethel	2	Summer Rose	2
Ackerman	2	Stump	1
Omer Pasha	2	Repra	1
Sutton's Early	2	Tetowka	1
Morton's Red	2	Lady Hennicker	1
McIntosh Red	2	Grand Duke Constantine	2
King of Pippins	2	Sutton Beauty	1
Canada Baldwin	2	Ostrowskoe	1
Martha	2	Count Orloff	1
May	2	Grand Sultan	1
Evaline	2	Seymore	1
Peffer's No. 1	2	Menagen	1
Addie	2	Occident	1
Layman's Sweet	2	Palmer Greening	1
Black Detroit	2	Amasia	1
Kingston Seedling	2	Paul's Imp. Crab	1

PEARS.

Tyson	2	Duchesse	1
Sheldon	4	Seckel	1
Beurre de Anjou	6	Duchesse d'Angouleme	2
Grey Doyenne	2	Pitmaston	1
White Doyenne	2	Goodale	6
St. Lawrence	4	Dana's Hovey	2
Mt. Vernon	3	Souvenir du Congres	1
Howell	7	Swan's Orange	4
Winter Nelis	3	Des Moines	1

PEARS—*Continued.*

Varieties.	NO.	*Varieties.*	NO.
Vicar of Wakefield	2	Ounger d'Eté	2
Bartlett	6	Beurre Clairgeau	5
Osband's Summer	2	Beurre Deil	4
Flemish Beauty	6	Josephine de Malines	3
Belle Lucrative	1	Dr. Reeder	5
Summer Frankfort	2	Doyenne Boussock	1
Louise Bonne de Jersey	3	Paradise d'Autumn	1
Beurre Hardy	2	Beurre de Waterloo	1
Nigley	2	Keefr's Hybrid	2
Rostiezer	3	Madeline	2
Clapp's Favourite	1	Beurre Gifford	2
Napoleon	2	Fred Clapp	2
Beurre d'Autumn	5	Urbanist	2
Prince Albert	2	Souvenir d'Espira	2
Manning's Elizabeth	4	Beurre Sanspariel	2
Brandywine	5	Columbia	2
Brockworth Park	3	Renne Langlier	2
Rutter	2	Emele de Heyst	1
Pratt	2		

PLUMS.

Lombard	10	Munroe	2
Diamond	2	Lawrence Favourite	2
Damson	3	Washington	2
Duanes Purple	1	Mill's Seedling	2
Pond's Seedling	4	Yellow Gage	4
Glass Seedling	2	Prince Englebert	2
Columbia	2	Green Gage	2
Goliah	2	Quackenboss	2
Bradshaw	8	Newman	2
H. R. Purple	5	De Carodine	2
M. Laughlan	5	Bryanstone Gage	2
Imperial Gage	2	Prune Agin	2
German Prune	2	Lucomb's Nonsuch	2
Ontario	2	Wild Goose	1

CHERRIES.

Early Richmond	9	Coe's Transparent	2
Black Tartarian	2	Empress Eugene	2
Montmorency	3	Downer's Late Red	2
Late Duke	2	Olivet	2
Knight's Early Black	2	Black Heart	2
English Morello	2	Yellow Spanish	2
Elton	2	Reine Hortense	2
White French	4	Rockport Begarreau	2
Monstreuse de Mezel	2	May Duke	7

The following small fruits are planted in lines between the larger trees in a portion of the orchard:

GOOSEBERRIES.

Smith's Seedling	110	Houghton's Seedling	120
Downing's Seedling	100		

Currants.

Varieties.	No.	*Varieties.*	No.
White Grape	50	Red Dutch	25
Cherry	50	Black Naples	100

Raspberries.

Philadelphia	600	Black Caps	12
Cuthbert	350	Gregg	200
Thwack	100	Saunders' No. 53	50
Turner	100	" " 70	20
Herstine	100	" " 72	20
Highland Hardy	100	" " 57	12
Brandywine	100	" " 50	12
Niagara	100	" " 67	5
Clark	50	Caroline	12
Davison's Thornless	100	Mammoth Cluster	150
Dorchester	12		

Strawberries.

Crescent Seedling	1,600	Maggie	150
Monarch of the West	250	Alpha	150
Triomphe de Gand	250	Mary Fletcher	25
Captain Jack	250	Arnold's Pride	150
Glendale	150	Early Canada	350
Cumberland Triumph	150	Wilson's Albany	800
Nicanor	150	Sharpless	100
Bright Ida	125		

Grapery.

The border forming the west boundry of the kitchen garden contains the only vines which we have in bearing order. They were planted six or seven years ago and consist of eighteen varieties, which were popular at that time, and for several years past have produced some good fruit, but last season, although luxuriant in growth of wood and foliage, the late spring followed by cold nights in June and July, kept them so late in a green and growing condition that the fruit was only commencing to colour at the usual time of ripening, so that only a few varieties and a very limited quantity (three or four bushels in all) were fit for use, consisting chiefly of the Delaware, Concord and Lindley. A few sorts viz. : the Adirondac, Iona, and Salem were slightly attacked by mildew, but whether this arose from their location or some other cause, I am not prepared to assert. The adjoining trees on the opposite side of the trellis, by their shade and root growth, now begin to show their effects on this border, and in the course of a few years, will so overshadow the vines that they will be useful only as a dividing line.

Hope centres in the new vineyard, commenced two years ago in a high and airy location in rear of the College building. Four hundred and fifty vines were then planted comprising fifty-five varieties, to which twenty-five distinct sorts were added last year—all of which are now in a promising condition. The first planted will do doubt show some fruit next season, and in each successive year it will be interesting, as well as profitable, to note the distinctive properties and peculiarities of so many sorts side by side,

The subjoined list contains the variety and number of each.

Grape Vines.

Varieties.	No.	*Varieties.*	No.
Concord	175	Canada	2
Brant	5	Dempsey No. 4	1
Jefferson	1	Prentiss	1

GRAPE VINES—*Continued.*

Varieties.	NO.	*Varieties.*	NO.
Walter	1	Cottage	3
Duchess	1	Verginnes	2
Lady Washington	1	Roger's No. 30	2
Rochester	1	" " 41	5
Una	1	" " 28	2
Eva	1	" " 39	1
Black Eagle	1	" " 2	2
Pearl	1	" " 33	1
Beauty	1	Pocklington	2
Janesville	3	Eumelan	3
Maxatawney	1	Isrella	3
Munroe	1	Early Dawn	3
Croton	1	Iona	2
Telegraph	1	Barry	5
Cuyahoga	2	Gaertner	5
Elvira	2	Senasqua	5
Ives Seedling	2	Merrimac	5
Alvey	2	Herbert	5
Hartford Prolific	5	Brighton	10
Sugawam	5	Lindley	15
Champion	8	Martha	9
Salem	9	Anluchon	1
Creveling	10	Lousiana	1
Agawam	10	Echland	1
Moore's Early	23	Noah	1
Wilder	23	New Haven	1
Massasiot	23	Green's Golden	1
Clinton	15	Norton's Va	1
Delaware	45	Cynthiana	1
Uhland	2	Maxim	1
Montgomery Red	2	Herbemont	1
Venango	2	Drauent's Amber	1
Othello	2	Triumphant	1
Cornacopia	2	Antionette	1
Mary Ann	1	Rulander	1
Black Hawk	2	Concord Chasselas	1
Amber Queen	3	Worden	1
Lady	2		

GREENHOUSES.

A few additions have been made during the year to our limited collection of Greenhouse plants; otherwise few changes have taken place. The stock throughout continues to be in as healthy a condition as can reasonably be expected from their accomodation and surroundings. The system of heating (by flues) is very defective. Some slight alterations and repairs have been made, which I trust will be some improvement, but I am satisfied that no good specimen plants can ever be grown in the present structure, unless some radical change is made. The workshop connected therewith is also in a very delapidated and unsatisfactory state, quite unfit for winter use, and unless replaced at an early date, I fear something more extensive than ordinary repairs will be required.

During the winter months, when time was more plentiful and labour less pressing, a portion of each day was devoted to practical instruction. I cannot here do better than quote from my report of last year, to Professor Brown;

"The various ways of root and top grafting were explained and practised by the students; also, the mode of propagating greenhouse and other plants; the watering, temperature and moisture required; the different systems of heating, and the potting, growing, hybridizing, and selection of plants generally; the composition of desirable soils for potting purposes; the insect pests that usually attack inside plants, with the means of getting and keeping clear of them; also the common and technical names of the plants we have, with the natural orders to which they belong. In all this the students generally manifested considerable interest, and, indeed, passed a very creditable examination at the close of the session; and not a few have so expressed themselves as looking upon these exercises of more real value to the practical man than the more tedious study of systematic Botany or Vegetable Physiology. It seems surprising how little the majority of intelligent young men know of the pot culture and management of plants. In this I believe that many could profitably take lessons from their elder or younger sisters. It is perhaps to be regretted that these practical lessons cannot be carried out to a greater extent into the Kitchen and Flower Gardens, the Orchard, the vineyard, and arboretum. This, however, cannot be done during the spring and summer months, unless more skilled labour is employed. One of the principal difficulties to be contended with in this department is to get the amount of work accomplished by student's labour, with advantage to them and justice to what is required of them—that is, to get the work accomplished in a satisfactory and workmanlike style; and with a growing demand for skilled labour, this want is greatly on the increase."

JAS. FORSYTH,

Superintendent.