

CHAPTER 5

MR. CREGAN DELIVERS THE FIRST LECTURES ON ENGINEERING

Head's suggestion that a commission of inquiry into affairs at King's College be established, was investigated by a committee of three of the College Council. They tendered their report to the Council on 16 March, 1853. This report could not help but find that there were problems at the college in respect of the low number of scholars, that the College was too expensive for the province to maintain, and that the lack of background ability of the scholars in attendance, presented difficulties. They went on to recommend a wider advertising program to acquaint the populace with the aims of the college, especially that all lectures could be attended on payment of a nominal fee without the requirement of matriculation. They agreed with Head¹ that "specific attention might be given to Civil Engineering, that is, to its leading principles, ..".. They also cautiously suggested that the students might benefit somewhat more from the availability of the telescope and related apparatus.

The professors were all invited to make submissions to the (Committee. A reading of their letters of response is illuminating, serving to cast their opinions in their own words. Jacob, as might

be expected, responded with invective, essentially starting that the Council might decide to include "Mensuration, Surveying, ..., Agricultural Chemistry ... which the wants of the country may suggest". Then stating, "I can only say that my Encaenial Oration for 1851 contains the deliberate and final result of my experience and consideration". That address, as we have already noted, decried vehemently the encroachment of the practical arts on the curricula of the university.

Robb, Jack and Head had all been through a system of education which concentrated on classics in the early years, in Robb's and Jack's cases, giving way to science during their University education. Since they all three belonged to the same organizations (Head was a patron of the Fredericton Athaenium to which Robb and Jack lent active support) and took active parts in the same local endeavours, they must have discussed the problems at length. Each appreciated the sentiments of Jacob and both Robb and Jack agreed with him in some measure. Robb's encaenial address of 1852 stated in part:²

"There are others, again who would begin by giving a professional education to lads, whose minds are as yet incapable of a power of sustained attention, and who are unprepared for general reasoning and speculation as to why and the wherefore of any operation... What we want, in short, is that which our own original charter has declared to be the express object of the foundation of this college - 1st the education of youth in the principles of the Christian Religion, and 2nd, their instruction in the various branches of science and literature as they are taught in other universities".

Robb appended a copy of this oration to his letter of submission in which he remarked that though in sympathy with the concept he felt the want of resources to constrain the College to its current curriculum. However, he did make two suggestions which were to become of critical importance: he felt that since the teaching resources of the College could not accommodate the inclusion of further sciences, "Perhaps something might be done by non-resident Teachers". His second suggestion was to "...remark that, by an order in Council passed away many years ago - which has never been repealed, so far as I know, although it has not been embodied in the revised statutes: non-matriculated Students were invited to attend my courses, upon payment of the sum of one pound per term: a certain number of persons have availed themselves of the opportunity thus afforded to them, and certificates of competency have been uniformly granted as required".

Robb was much disturbed over the controversy regarding the college. He had made overtures towards leaving King's early in the year for which Head had written testimonials on his behalf. Although Head doesn't state which university it was, he notes that Robb intended to apply for a chair at a "Scotch" university.³ As with Jack, who was also searching elsewhere, Robb was not successful in obtaining a new post.

It is difficult not to agree with Robb that considerable attention was being focused on practical subjects already. According to the House Journals he taught:⁴

1. Course of Chemistry with its applications to Art and Industry:

Heat: expansion, contraction, steam, temperature, fusion, etc.

Light: theory,

spectrum, photography

Electricity:

Magnetism: electromagnetism

Chemistry: Inorganic: the elements, acids, metals, metallurgy, etc. Organic: history of vegetable principles and products, processes of nourishment and growth, fermentation, combustion, dry distillation, etc.

2. Course of Geology:

Physical geography: physical conditions of the earth and atmosphere, temperature distributions, winds, climates, formations of the soil, earthquakes, etc.

Mineralogy: characteristics of minerals, classification, minerals found in New Brunswick.

Descriptive Geology: nature of rocks, fossils, petrification, geological maps and sections, veins of mineral matter and metallic ores;

Applications of Geology to Agriculture, mining, engineering, etc.

3. Course of Zoology:

Anatomy: the human system and lower animals

Physiology; Hygiene; classifications, distributions, geological succession of animals in time.

4. Course of Botany:

Vegetable anatomy; Vegetable physiology; Classifications, families, esp. in New Brunswick, distribution, etc. Brydone Jack taught:

5. Mathematics:

Geometry: plane and solid

Algebra: equations, series, logarithmic series, tables, compound interest, populations, annuities;

Plane trigonometry: computations, theora, formulae, description and use of simple mathematical drawing instruments;

Mensuration: of surfaces and solids;

Surveying and levelling: heights by levelling and barometer, distances by sound, reduction to horizontal plane, surveying with differing instruments, marine surveying, laying out and dividing land.

Principles of navigation: traverse, middle latitude, Mercator sailing;

Spherical geometry and trigonometry: astronomical problems and nautical astronomy;

Analytical geometry: equations, conic sections, transcendental curves;

Calculus: differentiation, maxima and minima, evolutes, integration applications.

6. Natural Philosophy:

Statics and Dynamics: gravity, properties of matter, laws of motion, composition and resolution of forces, projectiles and gunnery, strength of materials, theory of machines, etc.

Hydrostatics and hydrodynamics: properties of fluids, aqueducts, supplying towns with water, principle of the hydraulic ram, water wheels, capillary action, etc.

Pneumatics: air pump, air gun, diving bell, barometer, ventilation, draughts in chimneys, fire engine, condenser, steam engine, wind instruments, etc.

Optics.

7. Astronomy:

Distance, volume, mass and density of sun, solar spots, motions of heavenly bodies, precession, the moon, eclipses, comets, constellations, etc.

It is readily obvious from this that both Jack and Robb would be astounded to hear the complaint that their curriculum was not practical enough. Not only was it practical, but also it included the very latest developments in science, as even a cursory glance would indicate. The electromagnetic machine developments were not to become viable for another thirty years: yet they were included in basics, as was the development of the fledgling concept of "succession of animals in time," the theory of evolution was still some six years away from publication. It is quite clear that the problem of the college did not lie with its curriculum, although it was not advertised to the extent it might have been.

Jack's response to the committee was somewhat more tempered than Robb's. He appeared to favour extension of the practical aspects of the curriculum while agreeing with Robb that it could not be done with the resources at hand. Neither did Head favour the course he was about to embark on. He still felt strongly that a firm basis for scholasticism should be established before pursuing the professions. However, he alone seems to have perceived that to save the college from almost certain destruction, strong measures needed to be taken. He was quite aware that the real problem was the clerical versus rising secular powers; that it was indeed Jacob, through no fault of his own,

who represented the root of the difficulty, as we have seen from the various correspondences. However, Jacob himself had not yet been attacked openly: the people demanded instead an institution suited to their needs, even though they already had one. And even though provision was made for scholarships, students were not making effective use of them. Head had no alternative but to steer a course calculated not only to give the province what it asked, but also to be seen to do so.

By now it was perfectly clear to the College Council that their positions were precarious; they must accede, however reluctantly, to Head's guidance. They, therefore, agreed at a meeting on 2 April, 1853: "That one hundred and fifty pounds per annum be appropriated to defray the expense of Lectures and practical instruction to be given in Civil Engineering and Drawing by such person or persons as His Excellency the Visitor (Head) may appoint for that purpose, who shall receive a fee of five shillings per Term from every student attending such Lectures: and the student shall be entitled to receive a Certificate of the proficiency he makes therein, if he deserves it".

And in a subsequent codicil, the council provided that: "Any Scholar of the Collegiate School, on producing a certificate from the Head Master, may, if his Parent or Guardian desire it, attend any of the lectures at the College without payment of any additional fee".

By this statute Head was empowered to act, although he did not do so until almost the start of the next term. His chance to take action came about as a result of the coming of the railway. The European and North American Railway company proposed to build a line from Halifax around to

Saint John and thence to Portland, Maine, with a later addition to be built linking Saint John with Quebec. This proposal had been investigated at the Great Railway Convention held in Portland in 1850, but had subsequently failed. Early in September, 1852, the province entered into an agreement with Messrs. Peto, Betts, Jackson and Brassey for construction of the line from Saint John to the Nova Scotia border. The signing ceremony was held on Sept. 14, 1852, during the proceedings of which Head had opportunity to discuss the matter of engineering education with the railway officials and engineers. Finding a sympathetic reception to his ideas, Head accordingly responded to the College Council in a letter to the Chancellor⁵ dated September 17, 1853.

"Sir:

I have for some time been anxiously considering the best mode of applying the Money which the College Council placed at my disposal for the purpose of obtaining instruction in Civil Engineering at King's College.

It appeared to me that the best chance of supplying such instruction of a really practical and useful character was to seek for it among the Engineers employed in the Province under Messrs. Jackson & Co. I accordingly consulted Mr. Giles the Chief Engineer acting for this firm and he has assured me that one of his staff Mr. McMahon Cregan is fully competent in every way to teach that which I conceive to be required at King's College.

I have myself seen Mr. McMahon Cregan and have learned from him that he would be willing to lend his aid, and Mr. Giles states that he could be spared during a portion of the

Months of January, February and March. This would probably be as good a time for the delivery of a course of lectures on the elements of Civil Engineering and Surveying as could be selected.

I propose if the College Council concur with me, to offer Mr. T. McMahon Cregan a fixed sum of one hundred pounds currency for a course of lectures to be delivered in January, February and March on the subject stated above and that a fee in addition should be paid by each pupil say two pounds by students not members of the College and ten shillings by those who were matriculated. Such fees would of course belong to the lecturer.

Should the council think it expedient to carry out this scheme I would further suggest for their consideration that Professor Jack should between this time and the month of January organize a Mathematical Class for the purpose of imparting such special elementary knowledge as might better fit the pupils for further instruction from Mr. Cregan - any students not members of the College should of course be called on to pay to Professor Jack such fee as the College Council may approve.

I will thank you, Sir, to take steps for obtaining the views of the College Council on these suggestions as soon as can conveniently be done. Should they concur in them it will probably be expedient to give public notice of the intended course of lectures so soon as the assent of the council has enabled me to make the final arrangements with Mr. McMahon

Cregan who expects to hear from me again.

I ought to add in conclusion that I trust the Council will look upon these proposed arrangements as nothing more than the first step towards advancing the practical utility of King's College and that another year may enable us to improve upon them.

I am

Sir

Yours Faithfully

Edmund W. Head"

The council agreed that Cregan assume the duties of part-time lecturer at their regular meeting on Oct. 20, so informing Head, who wrote to Cregan the following day⁶

"My dear Sir,

The Chief Justice having laid before a College Council the proposed arrangement with you, I am happy to say that it meets with their active concurrence. I would now suggest that you should address to the Chief Justice as Chancellor a letter stating that in consequence of a communication from me you enclose for his consideration a memorandum shewing:

1. The time in the month of Feb. at which it would be convenient for you to commence your course of lectures.
2. The No. of lectures and intervals i.e. whether every day, 3 times a week, etc.
3. A short syllabus or summary of the course which you would propose to deliver.

As soon as these points are settled definitely with the approval of the college authorities they will no doubt advertise the proposed course so as to invite as many persons as possible to attend it.

I trust no impediment will interfere to prevent the benefit which the public will derive from your instruction.

Edmund Head"

On the same day Head wrote to the Chief Justice informing him of the contents of his letter to Cregan and requesting that advertisements be circulated "as widely as possible". One of the preliminaries, which did not receive due advertisement was Jack's series of preparatory lectures, which were to be given in the autumn term to prepare the students for the civil engineering lectures. Head does make mention of the possibility, though: "Perhaps too it might be well to advertise Professor Jack's preliminary course if not too late?" But it was!

The advertisement for the first regular course of Civil Engineering to be given in a University in British North America was duly inserted in the Royal Gazette in a release from the college dated Dec. 1, 1853:

"A course of instruction in Civil Engineering will be given at King's College by Mr. McMahan Cregan, who has been appointed to that duty by His Excellency the Visitor, and will commence on the 15th of February next, and continue until the end of April. It will be open to students of the College on payment of a fee of Ten Shillings, and to all others on payment of a fee of Two Pounds, for the course.

Persons desirous of joining the class are requested to communicate with the Registrar. The course will embrace, with other subjects, the following syllabus:

An explanation of the construction and uses of Logarithms, Sines, Tangents etc.; Trigonometrical Formulae; Resolutions of Plane Triangles; methods of surveying with the Theodolite, Circumferentor, etc; Construction, use and adjustment of the instruments used by Engineers, both for field and office work; Levelling; method of determining best route for Railway, etc.; computation of the quantities of land, earthwork, etc., required for the execution of the works; estimation of comparative labour by units of work; Horsepower of Machinery, etc.; method of "setting out" railway curves and side widths; calculation of gradients and theory of inclined planes; superelevation of rail; composition and resolution of forces; calculation of strains and pressures; strength of materials; theory and practice of timber and iron framing; viaducts, bridges, etc.

Three lectures a week will be given in the College, and instruction in the field will also be given once a week, or as often as may be expedient.

Fredericton, December 1, 1853

Charles Fisher, Registrar"

Dr. Jacob was not to be dismissed too lightly in the affairs which were then unfolding. In the Royal Gazette which carried the advertisement, and immediately preceding it, he had placed his own announcements ostensibly in respect of the annual examinations, but concluding with the

following paragraph:

"The statutes require all students, being members of the Church of England, to attend the Sunday Morning and Evening Services at the (Cathedral; and they are desired to occupy the six seats at the East end of the South Aisle, which the Bishop has assigned as most suitable for Members of the College.

E. Jacob, Principal"

This public notice made no mention of the fact that students were not required to belong to the Church of England. Indeed it quite appeared to say the opposite. This obsessive behaviour on the part of Jacob could not fail to have attracted the attention of the college opponents. And when they gained control in the legislature, as they were about to do, nothing but mischief could be expected to follow. In the interim, Head's excellent strategy was seen to accommodate the wishes of the people. The course was announced to begin on the 15 February. It was hailed in the Saint John Courier of Dec. 10, 1853:

"Mr. T. McMahan Cregan, now engaged on the survey of the European and North American Railroad, the gentleman who has been engaged to give instruction in that department is, we understand, well qualified for the task; and under his guidance, the young men of the country may be thoroughly trained for those occupations which the progress of railways will open up".

And when the first favourable reports came in after the commencement of the lectures, the Saint John New Brunswicker reported (Feb. 25, 1854):

" Cregan, who was engaged some time since to give a series of lectures in Civil Engineering

in King's College, delivered the introductory one on Wednesday last. Of this lecture we have heard a most favourable Report from those who were present at its delivery, who represent it as displaying a large amount of talent and practical information, skilfully conceived and well communicated".

In the session prior to the offering of the course there were only fifteen students in the college. In the session during which Cregan lectured in Civil Engineering, thirty-two students attended the college, ten of which attended the civil engineering lectures exclusively (Table I). However, Cregan had a class of twenty-six students altogether, including Adolphus Beckwith and Henry F. Perley, who later served as Civil engineers with the Dept. of Public Works⁸, the former in Fredericton, and the latter in Saint John, and Henry George Clopper Ketchum, who went off to make his fortune building railroads in South America, and later returned to perform several notable engineering services in New Brunswick. It was Ketchum who attempted to build a marine railway across Chignecto, coming an ace within completion of the project before the government withdrew its financial support. Alfred Whitehead became a civil engineer for the railways, at a time when New Brunswick was desperately wanting in such skills as he gained in the course. There were others whose names were to become well known in New Brunswick and elsewhere. But the one who achieved most in those early days of engineering was Hurd Peters.

Peters had graduated in 1849 with a B.A., articling in Law thereafter to become an attorney-at-law in 1852 and barrister-at-law in 1853. He returned to King's in order to take Cregan's course, achieving an M.A. at the same time, thus becoming at one fell stroke the first graduate engineer in Canada, as well

TABLE I*

Students attending Lectures on Civil Engineering exclusively:

Adolphus G. Beckwith	C.E., Fredericton
C. Elligood	
Samuel Fleming	
Charles Gregory	
Arthur Hansard	
William J. Hazen	C.E., Saint John
William Otty	
Henry F. Perley	C.E., Dept. Public Works, Saint John
Alfred Whitehead	C.E., Fredericton
C.P. Wolhaupter	

Resident Students of whom there is evidence of attendance in Cregan's course:

Hurd Peters	C.E., City Engineer, Saint John
Benjamin Robert Stevenson	Attorney, Q.C., Surveyor-General
George Sydney Smith	Attorney
John Stevenson	

Non-resident Students for whom there is evidence of attendance:

Henry George Clopper Ketchum	C.E.
Frederick Weyer Parker	
Frederick L. Diblee	(see corresp. with John S. Parks, U.A.)
George F. Gregory	Attorney
Frederick Eustace Barker	Saint John Bridge & Railway Ext. Co., Q.C., Chief Justice, KCMG, etc.
Alexander Wood	
W.L. Murray	

* This table is incomplete due to the inadequate records maintained. We know that the number of attendees was twenty-six from the report to the legislature (1855).

as the first to combine Law with Engineering. Peters was the younger son-in-law of Brydone Jack.

Although Jack tried to discourage his engineering interest, there is no doubt that some of Jack's practical bent had rubbed off on Peters. Jack, of course, had known Hurd for many years, and had

unsuccessfully attempted to guide his early career⁹ into law. It was to the greater fortunes of the province in general, and Saint John in particular, that Brydone Jack failed, because Peters went on to become city engineer for the City of Saint John in 1864. Peters was the person who was principally responsible for the development and building of the harbour of Saint John into the great Port of Saint John, thereby ensuring the prominence of the city for decades to come. In fact, Peters served in the capacity of engineer for the city for more than forty years, performing his job efficiently, lending his support when needed, and earning the greatest respect from the citizenry at large. When the Canadian Society of Civil Engineers, forerunner of the present Engineering Institute of Canada, was in process of formation, Peters was one of the original petitioners for a charter and on the first council of the organization. He was an exceptional man in an exceptional era: he was the stuff of which the province was made.

The Civil Engineering course lasted over two terms. The second term was advertised in the Royal Gazette. Lectures were to be as shown in the Handbill, a copy of which may still be found in the University Archives (Table II). After each course the participants were issued with a certificate¹⁰ of participation

King's College

Fredericton

May 8th, 1854

I hereby certify that Henry G.C. Ketchum has attended my course of lectures on Land and

Engineering Surveying and Levelling: - I have much pleasure in bearing testimony to his uniform good conduct and attention and with regard to his proficiency I beg to state that at the terminal examination he distinguished himself by a good and practical knowledge of the various subjects embraced in the course.

Signed T. McM. Cregan

At the end of that term, in June, the great experiment came to an end. As a result of the power struggle however, the curriculum had indeed become more practical. Many students thereafter adopted the credentials of engineers upon leaving the college, and were readily employed as such as far away as Boston and Pittsburg.

TABLE II
KING'S COLLEGE

Fredericton, April 19, 1854

LECTURES FOR EASTER AND TRINITY TERMS

By the Principal

- I. Greek and Roman Classics:-
1. Euripides, on Monday and Wednesday at 10 a.m.
 2. Juvenal, on Tuesday and Thursday
 3. Herodotus, on Monday and Wednesday at 11 a.m.
 4. Cicero, on Tuesday and Thursday
- II. Geography and Chronology, introductory to History, on Friday at 11 a.m. III. Sacred Literature, by special arrangement with Theological students

By Professor Jack

- I. Algebra, on Monday and Thursday at 12 n. and on Wednesday and Friday at 10 a.m. II. Spherical Trigonometry, and its application to great circle sailing, and nautical astronomy, on Monday, Tuesday and Thursday at 10 a.m.
- III. Practical Astronomy: - Construction and use of the sextant, the transit instrument, and the equatorial telescope; determination of the true meridian, and the variation of the magnetic needle; and methods of finding the local time, and the latitude and longitude of places, by actual observation; with solutions of various problems; on Wednesday and Friday at 12 n.
- IV. Natural Philosophy: - Capillary attraction and formation of waves; experimental illustrations of the nature and properties of fluids, and useful deductions; principles of the construction and action of hydraulic and pneumatic machines, illustrated by working models; on Monday and Thursday at 11 a.m.

By Professor Robb

- I. Mineralogy applied to the arts; a course of twelve lectures at 1 p.m. II. Botany, with practical illustrations in the field, and with the microscope; the course to commence in the second week of May; on Monday, Tuesday, Wednesday, Thursday and Friday.

By Professor d'Avray

- French language and literature; including oral translation of English into French, Tresor de l'ecolier, and Litterature Francais, on Monday. at 12 n. Theme et analyse, oral translation and literature on Thursday. Oral translation, Tresor, and Histoire de Charles XII., on Tuesday and Friday, 10 a.m., or Writing from dictation, and translation of English into French, alternately on Monday and Friday.

By Mr. Cregan

- Civil Engineering; including an explanation of the construction and uses of logarithms, sines, tangents, resolution of plane trigonometrical formulae, triangles, methods of surveying with the theodolite and circumferentor; the construction, use and adjustment of the instruments used by engineers; levelling; method of determining the best route for railways; computation of the quantities of land and earth-work required for the execution of the works; horsepower of machinery, method of setting out railway curves and sidewidths, calculation of gradients and theory of inclined planes, superelevation of rails, composition and resolution of forces, calculation of strains and pressures, strength of materials, theory and practice of timber and iron framing; viaducts and bridges; on three days in the week, with instruction to the Field on Saturday, and as often as may be expedient.

Encaenia on Thursday, June 29, at 12 n.

Terminal Examination on Wednesday, July 5 at 11 a.m.
E. Jacob, Principal