# TECHNICAL EDUCATION ABROAD AND AT HOME

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## ABROAD AND AT HOME.

BY
PROFESSOR J. G. MACGREGOR,
*Dalhousie College.*

"What is put into the schools of a country comes out afterwards in the manhood of the nation."—STEIN.

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# PREFACE.

This pamphlet is a reprint of a short series of letters contributed during the past winter to the *Morning Herald*. I have given them this more permanent form at the request of friends of University Consolidation, and of men who feel our need of Technical Education. My facts I have drawn from a great variety of sources. I may mention: *Rapport sur l'organisation de l'enseignement industriel en Allemagne et en Suisse*, published in 1864, by the French Government; Russell's Systematic Technical Education, 1869; Matthew Arnold's Report to the British Government on the Schools of France, Italy, Germany, Switzerland, 1868; *Preussens landwirthschaftliche Verwaltung*, 1875-7; *L'enseignement agricole en France*, by H. Johanet, 1882; Technical Education in a Saxon Town, by Felkin, 1881; Agricultural Education, by Prof. W. Johnston, 1881; Liversidge's Report to the Government of New South Wales, on Museums and Scientific and Technical Instruction in Great Britain, and on the Continent of Europe, 1880; the Report of the Quebec Commissioner of Public Works and Agriculture, 1880; Report of the United States Commissioner of Education, for 1879; Discussions on Technical Education, published by the American Institute of Mining Engineers, 1876; Apprenticeship Schools in France, and other pamphlets, by Prof. S. P. Thompson, Bristol; The Future of Mechanics' Institutions, by Prof. W. E. Ayrton, London; Report to the Japanese Government on the Engineering College, Tokio, 1878; papers in the Transactions of the Highland and Agricultural Society of Scotland, 1875-81; various Circulars of Information issued by the U. S. Bureau of Education; the Education Reports of the Provinces of Canada; and circulars, prospectuses, and calendars of Universities, Colleges, and Technical Schools.

J. G. M.

HALIFAX, May 10th, 1882.

# TECHNICAL EDUCATION

## ABROAD AND AT HOME.

In the following pages I wish to consider how Nova Scotia compares with other civilized countries in the matter of technical education. By technical education, I mean those forms of education which assist the people of a country in the development of its natural resources. I shall, therefore, have nothing to say of legal, medical, or theological education, or of that form of school and university training whose object is culture. Not that in these departments we have attained or are already perfect. We are in them also far behind the rest of mankind. But their effect on the development of the resources of the country, though of the greatest importance, is indirect. The effect of technical education would be direct; and yet the most of us are quite unconscious of the great gulf which in this matter separates us from the rest of civilization.

To make this gulf apparent, I shall first give a short sketch of the facilities for technical education which are supplied by other countries to their people, and compare with them those which Nova Scotia affords her sons. I shall then bring facts to show the value of this kind of education, and point out what forms of it Nova Scotia ought to have if she wishes to compete with other countries or even only with the other Provinces of Canada. Finally I shall consider the best means of establishing the necessary schools, and endeavour to make some estimate of their cost.

The best systems of technical education are to be found in Europe. In the short space at my disposal, however, it would be impossible to describe the systems of all the European nations. Let me therefore select one for somewhat detailed description. In the case of the others it will be sufficient to point out only those of their features which are of special interest to us. I select for detailed description the Swiss canton of Zurich, not because in respect of technical education it is foremost among the European nations, but because it has a population of only about 300,000, and can therefore readily be compared with Nova Scotia.

In the Swiss republic, as in the various States of Germany, primary education is compulsory. The period of compulsion extends over nine years. The first six are spent in the primary school, where the

pupils are taught among other subjects, natural history and drawing. The last three may be spent in various ways. If the pupil is the son of poor parents, and must work for his living, he attends the *Fortbildungs Schule*, or school for the continuation of education. It meets twice a week, and the training which it supplies has to do chiefly with the application of the knowledge gained in the first period to the wants of practical life. In most of the German States these continuation schools are evening schools. In all cases the subjects taught depend upon the class of industry in which the pupils are employed. They generally include drawing, geometry, and arithmetic. In agricultural districts, the pupils are taught the elementary principles of agriculture ; in manufacturing districts, the elements of the sciences bearing upon their daily work.

If, however, a pupil is able to continue daily study, he may, if not sufficiently far advanced for a higher school, enter what is called the secondary school, where he is taught not only ordinary subjects, but also the governmental organisation of Switzerland, geometry, the elements of physical science, with indications of its application to agriculture and other industries, and drawing. The course of the secondary school extends over three years, but the work of each year is a complete whole.

From any stage of the secondary school, or, if a boy is sufficiently far advanced at the end of the the first six years, from the primary school, he passes either to the Gymnasium (High Classical School) or to the Industrial School. If he is to enter one of the learned professions, he chooses the former; if he is to be engaged in engineering, architecture, manufacturing, etc., he chooses the latter. With the Gymnasia, I have nothing at present to do. They have no connection with technical education. Their course consists of literature, philosophy, and pure science, and extends over a period of six and a half years. From them the student who wishes to prosecute professional studies, passes to the University of Zurich, whose efficiency may be estimated by the fact that it has a staff of seventy-nine professors.

The Industrial School prepares its pupils either for immediate practical work in the lower departments of industry and commerce, or for the technical schools in which they study the higher departments. It is divided into the upper and lower schools. In the lower school whose course extends over three years, the following are the subjects taught: German and French, history, geography, natural history, physics, mathematics, arithmetic, geometrical and free-hand drawing, writing, singing, gymnastics and military drill. The studies of the upper school extend over two and a half years, and embrace the subjects of the lower school with English, Italian, mechanics, mechanical technology, commercial arithmetic, commerce, banking, exchange, book-keeping, office work, the knowledge of merchandise, commercial geography and statistics, political economy,

biology, mineralogy, chemistry, technical chemistry, industrial and perspective drawing. These subjects are arranged in three departments, those, viz., of chemistry, mechanics, and commerce. The department which a pupil takes is determined of course by his prospective employment.

Besides the Industrial Schools, the canton of Zurich possesses three special technical schools—the Veterinary School, the Agricultural School, and the Polytechnic School. The Veterinary School provides a course of instruction extending over three years, and embracing all the branches of pure and applied science necessary for the successful breeding and training of domestic animals, and for the cure of their diseases. The school possesses a hospital, a dissecting room, a smithy, and a museum. The Agricultural School is intended to turn out farmers, well equipped with scientific knowledge, and well trained in practical work. It has a farm which is worked by the students. The school has the use of the Cantonal Library, a museum, a collection of agricultural implements, and a botanic garden. I am not sure that there are any special trade schools in the canton of Zurich. Berne, however, had, according to a circular issued by Lord Stanley, in 1868, a Watch-making School, and a Wood-carving School; Appenzell, a Weaving School.

All the schools to which I have referred are cantonal. The Polytechnicum, however, is federal. It belongs to Switzerland rather than to Zurich. I quote from J. Scott Russell, F. R. S., an eminent English engineer, a sketch of its foundation. The quotation is long, but it has a good moral. "Switzerland," he says, "is, like ourselves, a free country, a religious country, and consequently embarrassed in action and organisation by the desire to abstain from interference with personal liberty of action, and liberty of enterprise. It is encumbered also in its initiative by the same sectarian hatred which sets Catholic Christians against Protestant Christians, High-churchmen against Low-churchmen, and orthodox folk against heretics of all sorts. These prejudices or principles, equally in Switzerland as in England, made men jealous—especially churchmen—of all other education than that bestowed by the Universities of the Church, and offered a dogged resistance to the establishment of universities which were designed to fit men rather for their destinies in this world than in the next. These prejudices in which we share, caused Switzerland to remain in arrear of educated Germany in this matter of technical education of the highest sort. . . It happened, however, about fifteen years ago (1854) that the government of Zurich was in the hands of wise, educated, and patriotic statesmen. These men clearly foresaw the enormous material benefit which would accrue to Switzerland, and especially to Zurich, from the training of the more highly educated youth to the practical business of life, by means of a university, in which everything that

was most valuable in the sciences, arts, and manufactures of all other countries, should be taught by the most distinguished men imported from all nations for that purpose, in the best manner which their wisdom could organise, and with all the practical means of learning placed at their disposal which could be invented or bought. Switzerland accordingly, and Zurich especially, set about this task with a zeal and self-sacrifice well worthy of our imitation, even if quite beyond all hope of our rivalry. The city and the state competed with each other to tax themselves, in order to endow worthily this new university of the nation. The Swiss are true patriots; and having once ascertained that their national system of education was defective in the great element of modern practical science, they determined to do, in the most thorough, systematic, and comprehensive way, that which they felt they had been wrong in so long neglecting. . . . . The founders of the Swiss Polytechnicum did not ask themselves the question: What is the smallest and least costly scale on which we can begin to make good a few technical deficiencies?— but they asked themselves this other question: What is there in the science, the philosophy, the learning, the art, and the practical skill of modern times, which can be learned and taught, or which has been taught or learned in any other school of knowledge, but for which there is no adequate provision already made for teaching to our own students in the university of the land?—and those things we will see to having thoroughly taught. They soon found that the German universities had long been in the habit of teaching far deeper science, far larger philosophy, and far profounder art, than the Swiss in the isolation of their mountains had ever dreamt of. They found in the manufactories of Prussia, Belgium, France and England, structures, machinery, and manufacturing processes utterly unknown to the skilled men of Switzerland. . . The founders and governors of the Polytechnicum, searched the annals of pure philosophy and applied science, for the names of those men who were best known for science, skill, and the love of teaching; and these men from every country they selected, and entreated to come and teach their children, considering only how they could best make it agreeable and convenient to them to become the teachers and patterns of Swiss youth. . . . . The Polytechnicum at Zurich is larger than Buckingham Palace; the apartments of students and professors, the lecture halls and museums, are large, lofty, well-aired, well lighted. The building itself is the *chef d'œuvre* of a German architect; and certainly, if we judge it by its fitness for its purpose, rather than by profuse decoration, or lavish embellishment, it is an admirable structure. Even physically therefore, or materially, it is a model institution, while morally, it teaches us this lesson, that there is one nation in the world sufficiently disinterested and patriotic to save money by extreme self-denial, in order to lavish