

Reviews

would like to be brought quickly up-to-date with a short, readable introduction to some of the most recent advances in educational technology.

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John Hubbel Weiss.
THE MAKING OF TECHNOLOGICAL MAN.
Cambridge, Massachusetts: Massachusetts Institute of Technology,
1982. 377 pp. \$30.00.

The reader may initially doubt that a book dealing with nineteenth century French Engineering Education would have any relevance for a general audience. Such a suspicion simply demonstrates that we come to a study of other types of education, particularly those in countries other than our own, with a preconceived set of baggage which tends to hinder our journey. Living in North America we have our particular hangups, which in part are inherited from Britain, and which are aggravated by what we interpret as an issue between general education and specialized education.

Engineering may be interpreted as a field reserved for specialists, but the primary title, **The Making of Technological Man**, reflects the importance of this book today at a time when technological advances multiply and we enter a new post-industrial age, which will change our society as radically as did the industrial revolution of the 1800's.

What is particularly apropos for Quebecers, living within a North American sphere of influence, is the gradual realization that there are two different models of preparing technological man. We have essentially adopted the British model, in which technologists and engineers have emerged from a striking variety of educational backgrounds, including picking up ideas in workshops and on construction sites, so as to form the self-made man. By contrast the French method, which became a model for Europe, was one where future engineers came from high social strata and followed a rigid system of formal schooling. In England, the first industrial nation, there were no formal engineering schools, and experience became the principal avenue of learning and training. For all later industrializers the process was necessarily different; for one thing, they were in a hurry to copy Britain and catch up with her new productivity. European nations had to rely far more than Britain on formal training offered in courses or schools. North America came closest to the British pattern partly because it could draw on British immigrants as a source of skilled labour.

By contrast, until 1825, because of a ban on the emigration of artisans and mechanics, Europe could not officially import skilled tradesmen.

Weiss's book is marginally concerned with the Ecole Polytechnique, which became a model for engineering schools throughout Europe. Its role was limited in that it fitted its students for the older forms of engineering (construction and mining). It could not satisfy other demands, which were met by certain private schools, the most important of these in scope of quality and overall influence being the Ecole Centrale des Arts et Manufactures founded in Paris in 1829. This single Parisian school during its first 20 years of existence is the prime concern of Weiss's book. The school filled a real need for education of a corps of engineers, entrepreneurs, and managers who were to perform a vital role in French industrial growth. Candidates for the Ecole Centrale were from the social and economic elite and mostly came from the upper bourgeoisie, with only 10% from tradesmen families. In this way the pattern of stratification of the July Monarchy was reproduced in the later hierarchies of industrial enterprises and in the structure of the engineering profession.

Education at the Ecole Centrale had four primary components. Courses were formal lectures of 90-120 minutes. Practical exercises took place in laboratories, workshops, and classrooms. There were also examinations and individual projects, of which the final project or competition was the most important. A somewhat paradoxical aspect of the program was a sort of training for industrial espionage. Students were taught to reproduce a machine from memory by sketching. Such a skill was particularly important at this time, when the export of machinery and the emigration of mechanics were restricted, and when secret information about particular machines could be obtained only by brief visits to British shops and mills.

What actually took place in the history of nineteenth century technology was something with far greater ramifications than the simple application of scientific theories or the training of an individual to fit a job. The Ecole Centrale was able to educate engineers on the basis that "la Science industrielle est une", which emphasized that there were no *ingénieurs spéciaux* but only *ingénieurs généraux*. This philosophy is evident in the training of men like Gustave Eiffel for a future in the chemical industry. This claim to a type of general education appealed to those searching for the Good, the True, and the Beautiful and for "culture générale". That engineers were trained as generalists and came from high social strata ensured that engineering and technology were as much respected as any other subject areas in nations such as France and Germany.

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By contrast one is drawn to speculate whether North American attitudes towards technology and our current lack of skilled manpower would have been different, had a greater influence been exerted by the French model instead of by the British one.

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