

The Polytechnikum (1855) and the human capital of the financial centre — overview and summary

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A financial centre is usually described through its institutions: its banks and insurers, its exchange, its central bank, its regulators and its courts. Behind all of them stands a less visible asset that is harder to measure and slower to build, namely the people who work in them. The actuary who prices a life policy, the engineer who assesses a power station financed by a bond issue, the chemist whose patent becomes the collateral for a venture loan and the mathematician who writes the risk model of a reinsurer all depend on an educational infrastructure that was created long before any of them was born. In Zurich that infrastructure has a precise starting point. On 7 February 1854 the Federal Assembly adopted the law establishing a federal polytechnic school, and on 16 October 1855 instruction began in makeshift premises scattered across the city.¹ The institution that grew from this beginning, renamed the Eidgenössische Technische Hochschule in 1911, has become one of the best-known universities in the world and one of the reasons why international firms, including financial firms, choose Zurich as a location.

This chapter tells the story of the Polytechnikum from the constitutional provision of 1848 that made it possible to the reforms of the first decade of the twentieth century that turned it into a university of technology. It begins with the long debate over a federal university, which ended in 1854 in a compromise that gave the Confederation a technical school in Zurich and left the classical faculties to the cantons. It then follows the opening of the school, the heavy financial obligations that the canton and city of Zurich accepted as the price of the seat, and the construction of Gottfried Semper's main building between 1858 and 1864. A third part looks at the early professors, many of them German, who gave the young institution an international reputation within a few years. The chapter then turns to the fields that matter most for the history of a financial centre: engineering and mathematics, the early teaching of insurance mathematics, the emergence

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of an actuarial profession, chemistry and its ties to industry, and the neighbouring University of Zurich with its faculties of law and political science. The final sections describe the networks that connected the Polytechnikum with industrial companies and banks, the renaming of 1911 with a brief look at Albert Einstein, and the place of ETH Zurich in the financial centre of today.

The three perspectives of this book meet with particular clarity in this subject. For the historian, the foundation of 1854 is a lesson in federal compromise, because an institution that was intended as a national university could be created only after it had been reduced to a technical school that threatened no cantonal university and no confessional sensibility. The lawyer sees a short federal statute that allocated competences between the Confederation and the seat canton with remarkable economy and that remained in force, in amended form, for well over a century. For the practitioner, finally, the Polytechnikum explains a feature of Zurich that visitors from London, Singapore or Hong Kong notice at once. Zurich's bankers, insurers and asset managers draw on a pool of engineers, mathematicians and computer scientists that is unusually deep for a city of its size. The connection between technical expertise and finance has been part of the city's economic culture since the second half of the nineteenth century. Railway finance and the Schweizerische Kreditanstalt, which belong to the same years, are treated in Chapters D.I and D.II. Insurance, which drew heavily on the mathematical expertise described here, is the subject of Part E.

1 Notes

1. ETHistory 1855–2005, “1848–1855: Polytechnische Fundierung eines alten Traums”, ETH Zurich, <http://www.ethistory.ethz.ch/besichtigungen/epochen/debatte1/>. The site was created for the 150th anniversary of ETH Zurich in 2005 and summarises the research of David Gugerli, Patrick Kupper and Daniel Speich. ↩

2 Conclusion

The foundation of the federal polytechnic school was the product of a failed ambition. The liberals of 1848 wanted a national university. They obtained a technical school because the Catholic cantons, the French-speaking regions and the existing universities would accept nothing more. The compromise of February 1854 limited the Confederation's role to technical subjects, placed the school under a federal board and gave Zurich the seat

in exchange for the obligation to provide and maintain its buildings. Zurich paid a high price for that seat. Semper's building alone cost about 1.7 million francs, while the canton remained the owner of the school's premises until the separation agreements of 1905 and 1908.

The school justified the investment within a generation. Its first professors, recruited mainly from Germany, included some of the leading engineers, physicists and mathematicians of the century. Its general division brought humanists and economists such as De Sanctis, Burckhardt, Vischer and Cherbuliez to a technical school. The students came from across Central and Eastern Europe and carried the reputation of Zurich back to their home countries. The mathematical tradition established under Kappeler's presidency produced the first lecture on insurance mathematics in 1858–1859, only a year after the foundation of the Rentenanstalt, and laid the ground on which the actuarial profession, organised nationally from 1905, and much later quantitative finance could grow.

The Polytechnikum was also part of a dense network that connected academia with industry and finance. Its graduates founded and led machine-building and electrical companies. They sat on the boards of railway companies, organised themselves in an influential alumni association and fought successfully for the patent protection that made their inventions financeable. The Kreditanstalt and the other Zurich banks financed the enterprises in which these engineers worked, while the financing companies of the electrical industry chose Zurich as their seat because the city combined capital, legal expertise and technical judgement. Alfred Escher, vice-president of the school board, head of the Nordostbahn and chairman of the Kreditanstalt, personified that network in its first generation.

For today's financial centre, the Polytechnikum's most important legacy is its human capital. The tradition of quantitative reasoning that began with Dedekind and Christoffel now serves the risk departments of banks and insurers, the quantitative finance programme run jointly by ETH and the University of Zurich, and the artificial intelligence research that attracts global technology firms to the city. Human capital is harder to move than financial capital and takes generations to accumulate. That is why the decision of 1854, and Zurich's willingness to pay for it, still counts among the foundations of the city's position as an international financial centre.

3 In five sentences

1. The Federal Constitution of 1848 permitted the Confederation to found a university and a polytechnic school, but confessional, linguistic and

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cantonal resistance defeated the university, so that the law of 7 February 1854 created only a federal polytechnic school with a general division for the humanities and political science.

2. Zurich obtained the seat in exchange for providing and financing the premises, including Gottfried Semper's main building of 1858–1864 at a cost of about 1.7 million francs, and remained the owner of the buildings until the separation agreements of 1905 and 1908.

3. An international faculty that included Semper, Clausius, Culmann, Reuleaux, Zeuner, De Sanctis and Burckhardt, together with a strong school of mathematics built up under school board president Kappeler, gave the Polytechnikum an international reputation within a few years.

4. The school fed the financial centre directly through insurance mathematics (first lecture 1858–1859), graduates who founded and led companies such as the Maschinenfabrik Oerlikon, an alumni association that obtained the Patents Act of 1887, and a network of engineers, lawyers and bankers that made Zurich a seat of financing companies such as the Elektrobank of 1895.

5. Renamed ETH in 1911, the institution is today one of the world's leading universities, whose engineers, mathematicians and computer scientists form a location factor for the financial centre that competitors could reproduce only over generations.

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