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Physicists and chemists at the University of Vienna of Technology around 1900: Mobility and career patterns

BEFORE BEGINNING TO ANALYZE the career patterns and options of chemists and physicists at University of Vienna of Technology around 1900, some introductory remarks on the local institutional framework seem appropriate.

Scientific careers are not only the result of an outstanding intellectual capacity and hard work, they also depend on circumstances that cannot easily be influenced by an individual person, like social and local origin, economic situation, the state of development of a discipline at a given time, its representation in an academic organization, the position of an academic institution on the local and national level of concurrent institutions, and the intentions of academic education and resulting career options for graduates.

University of Vienna of Technology, one of the oldest technical universities in Europe, was founded as “Vienna Polytechnical Institute” (k.k. Polytechnisches Institut in Wien) in 1815. It was intended as a flagship institution for the Habsburg monarchy to encourage technical and economic development.¹

From the beginning, Chemistry and Physics were part of the fundamental set of disciplines present at the institution. But while Chemistry counted as one of the technological core disciplines, physics served, at least throughout the 19th century, primarily as basic or ancillary discipline for mechanical and civil engineering, and architecture.

The different role of both disciplines is reflected in the Institute’s organization. Chemistry was from the very beginning present with two full chairs (out of a total of eight), one for “general” and one for “special chemistry” (meaning special chemical applications in industry). After a fundamental reorganization of the Polytechnical Institute in 1865 for the first time a department structure was introduced. A few years later, the name of the institution was changed to “k.k. Technische Hochschule in Wien” (Vienna University of Technology²). Chemistry formed an own department (or “school”) of “Technical Chemistry” in this new scheme. The number of chairs was soon extended to three, in the 1880s to five, and after 1900, to seven.

Physics, on the other hand, was for decades represented by only one chair. In 1866, it was divided into two chairs, which were reunited again in the mid-1880s. Only after the turn of the century, in 1905, a second chair of Physics was established again, this time lasting for more than half a century. In 1865, physics was not transformed into an own school, but became part of a “general department” together with mathematics, geodesy, and other subjects regarded as complementary for the education of an engineer, like law, languages, and the like. It was only after the First World War, in 1922, that the professor of Physics Heinrich Mache succeeded in having established a sub-division for “Technical Physics” in the frame of the general department. This was soon regarded as a model for implementing “Technical Physics” at other German Technical Universities. The reason for this step

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¹ For the history and organization of the Vienna Polytechnical Institute and its successor, the Vienna University of Technology (k.k. Technische Hochschule in Wien) see: Josef Neuwirth, *Die k. k. Technische Hochschule in Wien 1815–1915, Wien 1915; 150 Jahre Technische Hochschule Wien*, hrsg. im Auftrag des Professorenkollegiums von Heinrich Sequenz, 3 Bde. (Wien 1965). Erich Jiresch, Juliane Mikoletzky, *K.k. Polytechnisches Institut – Technische Hochschule – Technische Universität Wien* (Wien 1997).

² In the following, the term of “Technische Hochschule” is translated as “Technical University”, for the status of the Vienna Institution was always equivalent to a university, so that translations with “technical college” or the like do not indicate its proper position in the educational system.

was not an intra-scientific one, but the fact that now there was a growing demand for technical physicists in industry. This was partly a consequence of the development of electrotechnics as a new discipline: Physicists were among the first professors engaged to teach in the emerging field of electrotechnics from the 1870s on. At Vienna University of Technology, the Physicist Victor Pierre had to lecture on electrotechnics from 1866 on, and in 1883 the Physicist Adalbert v. Waltenhofen was appointed the first professor of electrotechnics.

On the local level, Vienna University of Technology was not the only academic institution where Chemistry and Physics were taught: The University of Vienna and, since 1872, the University of Agriculture were concurrent institutions, though the profile of teaching and research was slightly different. At technical universities, the focus generally was more application oriented compared with traditional universities, and it is quite evident that in the course of the 19th century there developed different “cultures”, even if the name of the disciplines was the same. This was reflected in different educational goals: Education at technical universities generally aimed at producing engineers qualified for a leading position in industry (and, to some degree, teachers for higher vocational schools); therefore, career options for graduates from Vienna University of Technology ranged from industrial jobs to positions as academic teachers and also as teachers in the (since 1880) expanding field of higher vocational schools (“Staatsgewerbeschulen”) and secondary “Realschulen”. Despite these differences, interchange of students and academic personnel between traditional and technical universities was frequent.

In the following will be presented the results of a short examination of the professional biographies of chemists and physicists teaching at the Vienna University of Technology (k.k. Technische Hochschule in Wien) between 1880 and 1918. This sample of 47 scientists (38 chemists and 9 physicists) includes full professors, associate and honorary professors³, and privatdozenten (that is, persons with a habilitation, but not necessarily with a fixed salaried position inside the university). Trained physicists that were appointed as professors of electrotechnics are included as well. All persons examined were male, as women were allowed to enrol at Austrian technical universities only in 1919, and the first female scientific personnel did not appear before 1918.⁴

With their birth dates ranging from 1828 to 1887, these 47 persons represent several generations of scientists. Best represented were the generations born in the 1850s and in the 1870s.

Geographically, Vienna and the surrounding parts of lower Austria were the dominant birth regions (28 persons came from that region, and of these 21 from Vienna). Ten scientists were born in one of the Bohemian crownlands, six in Hungary, four in other crownlands. None of the persons examined was born outside the Habsburg monarchy. This pattern reflects the general recruiting areas of University of Vienna of Technology: Created as a leading national institution, from the beginning students and teachers came from all over the Monarchy, though the western crownlands (Tyrolia, Vorarlberg, Salzburg) were traditionally less present, and the influx from Hungary went down after the “Ausgleich” of 1867.

Regarding their social background, ten of the 47 Persons examined came from lower middle class families (according to their father’s profession), while 20 came from the upper middle classes, mostly higher civil servants, factory owners or managing directors, lawyers, doctors, and military men. Three came from the free professions, and only three were sons of university professors. Another three came from the lower classes, while for eight persons there was no information on their social background available.

In general, this means that for the majority of the academic teachers at the Vienna University of Technology around 1900, reaching the position of a full professor meant a considerable social upward mobility. This seems to support the thesis that especially the technical universities were a good starting point for social climbers. (We have to keep in mind here that, other than in Germany, in Austria the social status of professors of technical universities was *not* lower than that of “traditional” university professors.) For others it meant a sort of sideways shift to another segment of society at a similar level, especially from

³ With “full professor”, we translate the German “ordentlicher Professor”, with “associate professor” the “außerordentlicher Professor”, and with “honorary Professor” the position of “Honorarprofessor” or “Honorarprofessor”.

⁴ The data used for this sample have been collected from the personal dossiers of the 47 scientists kept in the University Archives of Vienna University of Technology.

the economic section of the middle classes to the academic section. The self-recruiting quota of the professors at Vienna University of Technology, with two out of the 47, seems remarkably low.

Most interesting in our context is the question of career mobility. We may differentiate here between student mobility and post-graduate professional mobility. And while there have been observed no fundamental differences concerning the geographic and social background between chemists and physicists, it seems that we can discern quite specific patterns for the two groups if it comes to student and professional careers.

Generally professional mobility was high. Only about less than half of the sample (20 out of 47) passed their whole student life at only one University (mostly in Vienna), while 27 changed university at least once or more often. By far the largest number started their studies at one of the Viennese Universities (University of Vienna, Vienna University of Technology or, after 1872, University of Agriculture). From those that changed university, nearly half (12 out of 27) changed to another Viennese institution; especially the changes between University of Vienna and the Vienna Technical University was frequent — in both directions. Nine persons changed twice, and two only changed three times. The second and third change usually was for a foreign university. Before 1901, when Austrian technical universities got the right to confer doctorates, an important reason for changing the university was for graduates of a technical university to get a doctorate. Another reason was, of course, to work with famous scientific capacities.

Destinations outside Vienna were mostly German universities, especially Berlin and Heidelberg (preferred by chemists), Göttingen, followed at a distance by Prague, the Zürich Technical University (Eidgenössische Technische Hochschule Zürich), Paris, and some other universities in the Habsburg Monarchy, like Graz or Prague. But while the majority of the chemists (30 of 38) passed at least a part of their studies at the Vienna University of Technology, it was different with physicists. Only the three born before 1852 began and/or accomplished their studies at the Vienna Polytechnical Institute; their six younger colleagues without exception studied physics at the University of Vienna.

But also during their post-doc period, young scientists had to be mobile. Eleven of the 22 full professors of our sample (= 50%) made a pure “inhouse” career. The other eleven passed through several career positions. For six persons of the sample, Vienna University of Technology was a transitory career position, the others came back at some later stage of their academic life.

Of the 47 persons examined, nearly half reached the position of a full professor at the Vienna University of Technology (N=22), seven that of an associate professor. A considerable number of 13 figured only as “privatdozent”, and only four of this group later reached a full professorship at another university. These were Rudolf Wegscheider, who later became a full professor at the University of Vienna, Ernst Berl, who was in 1918 appointed Professor at the “Technische Hochschule” at Darmstadt and after his forced emigration in 1933 at the Carnegie Institute in Pittsburgh, and Anton Skrabal and Zdenko Hanns Skraup, who both later on got a full professorship at the University in Graz. The others followed an industrial or other career path.

It is important to stress that career paths for graduates of technical universities included not only academic, but also industrial options. This is at least true for chemists — the nine physicists of my sample without exception followed a purely academic career. Moreover, graduated chemists and physicists could also decide to teach at one of the “Staatsgewerbeschulen” newly established in 1880 or at other higher vocational schools. But especially the latter option very often meant to give up an academic career, even if a habilitation and admission as “privatdozent” was achieved, while a return from an industrial job into academe and to a full professorship was possible. From the 22 full professors, eight had been working for some time in industry, and only one had some, very short, experience as a school teacher. But those of my sample who had tried to combine an industrial career with an — often part time — teaching job were in no case able to reach a full professorship. This did not generally mean that their scientific capacity was minor. So e.g. the pioneer of photographic science and the founder and director of the Graphic Teaching and Research Institute in Vienna (Graphische Lehr- und Versuchsanstalt), Josef M. Eder, belonged to this group — he only reached the position of a “tit. Professor” (an academic teacher with the title of full professor) at Vienna University of Technology. A more important reason seems to be a too long time of institutional distance to the university. Especially the change from a school teaching position to a professorship seems to have been extremely difficult.

On the other hand, especially among the privatdozenten with an industrial job many may not have had the wish to change to academe. In some cases, their *venia legendi* may have been too specialized, and their discipline not (or not yet) present in the range of disciplines that was incorporated in the university organization.

To summarize, some of the patterns that seem to emerge shall be pointed out. They do not allow general conclusions, but they do allow to form some hypotheses and further questions.

1. Though geographic mobility, especially of students, was high, it seems that the mobility of “born Viennese” scientists was slightly lower than that of those coming from the periphery of the monarchy. This may have been a consequence of the outstanding offer of studying and working opportunities in the scientific field, and of course the high prestige of all institutions located in Vienna as the capital and scientific centre of the Habsburg monarchy.

A closer look into the situation of different sub-disciplines and their development around 1900 could give further insight here.

2. Destinations of student mobility of later scientists were usually some scientific centres in Germany and to a lesser degree in other countries bordering the monarchy; significantly less often we see a movement to universities in the other crownlands of the monarchy itself. The preference for German universities is easily explained by the geographic nearness and missing language barrier, and especially for chemists by the leading role of German chemical science throughout the 19th century. Before 1901, a more formal reason for changing from Vienna University of Technology to a university was the lacking possibility to get a doctorate from an Austrian technical university.

It would be interesting to look into in-migration of German students at Austrian Universities in comparison.

3. Around 1900, at Vienna University of Technology as well as at other Austrian Universities, (full) professors coming from a foreign country were exceptional to nonexistent. Reasons were partly the comparably low level of income and scarce financial resources for university science (often regretted by Austrian scientists and professors), partly legal regulations that were not exactly welcoming scientists from abroad. Again a look into the other direction could be interesting: Was there something like a “brain drain” of scientists from Austria to Germany around 1900?
4. Patterns of geographic movement: Generally, regional mobility in the postgraduate life period was quite usual and not detrimental to an academic career (and it was not necessary, too). Very often, returning to the “home University” after a period of migration seems to have been the final goal of an academic career. Nevertheless it has become quite evident that there was a small number of preferred “exchange partners” for chemists and physicists from Vienna University of Technology. Most frequent were changes to/from the University of Vienna, after 1872 also to/from the University of Agriculture. For physicists, there existed certain connections to Innsbruck University, while other universities or technical universities (Prague, Graz) were clearly of minor importance for a scientific career. Only one person in our sample, Ernst Berl, went abroad: he took, in 1918, a full professorship at the TH Darmstadt.
5. Changes between industry or teaching at higher vocational schools and academe were, at least for chemists, not unusual, but especially the change from a teaching position to a full professorship seems to have become more and more difficult.
6. Social mobility: While an upper middle class background was dominant among the university scientists, a scientific career started at Vienna University of Technology was a possible way for upward social mobility for sons from lower middle class and even lower class families. Remarkable was especially the low rate of self-reproduction of the professors of the Technical University.