Reprinted from AMERICAN JOURNAL OF PHYSICS, Vol. 17, No. 5, 315–316, May, 1949
Printed in U. S. A.

Some Reminiscences of My Teaching Career

A. SOMMERFELD
Dunantstrasse 6, Munich 23, Germany

LIVING as I am in the evening of my life, I take pleasure in looking back over my long teaching career in theoretical physics, which is closely connected with the tremendous rise of physics in this century. During the years 1908 to 1910 I particularly enjoyed giving special lectures on the theory of relativity, especially in its four-dimensional form, as developed by Minkowski. From 1912 on, it was Bohr's theory that I tried to make clear to my students as well as to myself; after 1926 it was wave mechanics. My first lectures on this theory were heard by Linus Pauling, who learned as much from them as I did myself. In 1927, in my special lectures, I also treated the theory of electrons in metals for the first time, and published them soon afterwards, together with C. Eckart and W. V. Houston. In connection with this, N. H. Frank of Massachusetts Institute of Technology and I were able to report on the complicated thermoelectric and thermomagnetic effects in one of the first numbers of the *Reviews of Modern Physics*. During a brief summer semester I. I. Rabi and E. U. Condon were among my students.

However, I should like to speak here only of those students who wrote their theses under me and are at present in the United States. In this connection should be mentioned first of all P. Debye from Maastrich, who was my assistant in Aachen. When I received a telegram from Röntgen concerning my new appointment, I said: "Debye, we have a call to Munich." He really did not hesitate for one moment to accompany me to Munich, where he began his march of triumph in the fields of physics and chemistry. P. S. Epstein, now in Pasadena, was able during the first World War to enter and leave my Institute at will, even though he was a native of Russia. At that time he wrote the wonderful treatise on the Stark effect. A. Landé originated his famous *g*-formula, to be sure, without my help, in that he generalized the special cases treated by me; however, he too received his doctor's degree under me. Last but not least, I mention Hans Bethe. That my opinion of him was correct may be seen from the fact that I suggested for his doctor's thesis the observations of Davisson and Germer, whose theory at that time was still in quite an unsatisfactory state.

Personal instruction in the highest sense of the word is best based on intimate personal acquaintanceship. Ski trips with my students offered the best opportunity for that. Munich is situated so close to the mountains that one can reach the ideal ski terrain of the "Sudelfeld" by rail in two hours. There I had a ski hut together with my mechanic Selmayr, the builder of ingenious models of crystal structures, which are also known in the United States. The neighboring hut belonged to my colleague from the Technische Hochschule, J. Zenneck. He and I spent many a weekend there with our candidates for the doctorate. Selmayr always praised especially the good humor of the American students and their willingness to get water, split wood, and wash and dry dishes. I remember well the first bold attempts at skiing of W. P. Allis of Massachusetts Institute of Technology. In the evening when we were gathered around the stove, it was inevitable that our conversation should turn from snow and weather to the subject of mathematical physics.

The years 1920 to 1922 represent an especially remarkable period, for at that time two freshmen came to my Institute: Wolfgang Pauli from

FIG. 1. Arnold Sommerfeld, his wife, and one of his two sons. The background was the new wing of the University of Munich, of which a few fragments are still standing. (Photograph by E. H. Kraus.)

Vienna and Werner Heisenberg from Munich. Pauli, the son of a well known professor of medical chemistry at the University of Vienna, had just finished the Gymnasium at Vienna, but had already secretly, "below the desk," studied Einstein's treatises. Heisenberg's father, professor of Byzantine language and literature at our university, had told me that his son was especially interested in mathematics and physics. At the latter's first conference with me, he told me that he had read Hermann Weyl's book, *Raum, Zeit, Materie*, and that he believed he understood it. I could not help but say to him: "It is a lucky chance that I am going to give a course in elementary mechanics this semester. Just do the exercises diligently; then you will find out what you have understood and what you have not." But during his second semester, when I gave a course in hydrodynamics, I agreed to his publishing a note on vortices in the *Physikalische Zeitschrift*. I said to my colleague Heisenberg: "You belong to an irreproachable family of philologists, you, yourself, being a great expert on the late Greek period, your father-in-law a famous expert on Homer, and now you have the misfortune of seeing the sudden appearance of a mathematical-physical genius in your family." Soon afterwards I published together with the younger Heisenberg a treatment of the intensity of multiplets using the correspondence principle. Something similar occurred in the case of Pauli. I had undertaken the editing of the volume on physics of the *Mathematischen Encyclopädie*. The article on the theory of relativity was still lacking. Since Einstein did not want to write it, I suggested to Pauli that we do it together. But when he showed me the first draft of his essay, it proved to be so masterly that I renounced all collaboration. The work of the 22-year-old is unsurpassed to date. I naturally urged both Pauli and Heisenberg to take part in laboratory work as well. They worked together with their friend Otto Laporte in joint experiments under my colleague W. Wien; Pauli contributed more advice than work in order to avoid a "Pauli effect." For Laporte I brought along from Pasadena reports of the Zeeman effects on the sun by H. D. Babcock, on the basis of which Laporte succeeded in clearing up the iron spectrum.

But in addition to my special students, I also had to attend to the rest of our students. I did that in a 6-semester course, beginning with mechanics and ending with the partial differential equations of physics. In this connection I assumed that the students had already got over the mathematical children's diseases (differential and integral calculus, analytical geometry, and theory of simple functions). I asked some instructors to prepare, among other things, an introduction to vector analysis, which is usually somewhat abbreviated or presented in a form unsuitable for use in physics in mathematical instruction in Germany. I used to organize my own lectures in such a way that they were too easy for advanced students and too difficult for beginners. The lectures were confined essentially to classical physics, which, as a basis for all modern developments, must never be curtailed. In the last few years I have been busy preparing them for publication. To date, they have been, or are in the process of being, printed as far as Vol. V (thermodynamics and statistics). I am glad that the Academic Press Inc., N. Y. is doing an English translation and that they were able to turn over the translation of Vol. VI to Dr. Strauss. Another circumstance that has given me great pleasure is the recognition which my teaching activity has received, as indicated by the presentation to me by my American friends of the Oersted Medal.