

No one in his right senses in Hungary, no matter how much he was interested in physics, would major in physics in Hungary. I myself majored in electrical engineering but when after the First World War, I went to Berlin to continue my studies, the attraction of physics became so great that I dropped my studies of engineering and set out to obtain a Doctor's Degree in physics at the University of Berlin. I very nearly did not make it, but then, suddenly, my work began to turn out very well. I got my degree and I was regarded as a young man of great promise by those whose opinion I valued most highly. In the 1920s physics was the king of the sciences and Berlin was a great center of Physics.

Ever since I was 13 I was interested in physics and in public affairs, but I kept these two things sealed in water-tight compartments and it never occurred to me that these two interests of mine would ever meet. Because of my interest in public affairs, Nazism in Germany did not come as a surprise to me. In 1933, when Hitler took office, I kept two suitcases packed in my room in the Harnack House, the faculty clubhouse of the Kaiser Wilhelm Institutes, and after the Reichstag was put on fire I picked them up and I took a train to Vienna. There I tried to appraise what may be in store for those scientists and scholars on the staff of German universities who would be unacceptable to the Hitler Government. Some organization ought to be set up abroad so I thought,

preferably in England, which would undertake to find positions for those who will be forced to resign from their university positions in Germany. A chance encounter with Sir William Beveridge was instrumental in the setting up of such an organization in London and it also landed me in London in the late spring of 1933.

The collapse of the Austro-Hungarian Army was followed by a troubled period in Hungary, and ended with the Communist government of Béla Kun which lasted about four months. This government lasted too short a period of time to be able to do anything except hold office. During this period the things which <sup>had</sup> deteriorated during the war deteriorated even further, and I made up my mind that I wanted to leave Hungary in order to study in Germany. [insert \*]

(note)

\* As far as I can see, I was born a scientist. I believe that many children are born with an inquisitive mind, the mind of a scientist, and I assume that I became a scientist because in some ways I remained a child.

"Back from Chapter 3"

The set of values of the society in which I lived in Budapest was conducive for a young man to dedicate himself to the pursuit of science, and the poor quality of the teaching of science at the universities in Hungary furnished stimulation to independence of thought and originality. ~~independence~~

One year before I had been drafted I <sup>had</sup> entered, as a student, a Hungarian Institute of Technology in order to study electrical engineering. My real interest at that time was physics, but there was no career in physics in Hungary. If you studied physics, all that you could have become was a high-school teacher of physics, not a career that had any attraction for me. Therefore I considered seriously ~~to do~~ the next best thing and ~~to study~~ <sup>including</sup> chemistry. I thought that if I studied chemistry I would learn something that <sup>was</sup> ~~is~~ useful in physics and I would have enough time to pick up whatever physics I needed as I went along. This I believe in retrospect was a wise choice, but I didn't follow it; for all those whom I consulted impressed upon me the difficulty of making a living even in chemistry and they urged me to study engineering. I succumbed to that advice, and I cannot say that I regret it, because whatever I learned while I was studying engineering <sup>stood</sup> ~~came~~ me in good stead later after the discovery of the fission of uranium.

[notes]

During the troubled times of the Communist regime of Béla Kun, I made a strenuous effort to obtain a passport and to go to continue my studies of electrical engineering in Germany. One or two days after these efforts were successful, the Communist regime collapsed and was replaced by the regime of Horthy. Thus I had to start from scratch in my quest for a passport, but through the help of friends I got one rather quickly and I left Hungary to go by way of Vienna to Berlin. This was about the worst time after the war because of the coal shortage. There was a shortage of food and there was a shortage of coal; because of <sup>the</sup> ~~a~~ shortage of coal, travel was slow, and as a matter of fact it took me two weeks to get from Budapest through Vienna to Berlin. (note)

I stayed in Vienna only for a few days, as long as it was necessary to make arrangements for the trip to Berlin; but during those few days I was greatly impressed by the attitude of the Viennese, who in spite of starvation and misery were able to maintain their poise, and were as courteous as they have always been, to each other, as well as to strangers.

In Berlin I had to face new difficulties. The number of foreign students who were admitted <sup>was</sup> ~~were~~ limited. The attitude towards foreign students was not friendly in this respect, and I had ~~in~~ <sup>had</sup> ~~in~~ <sup>in</sup> Hungary considerable difficulty in obtaining a German visa. ~~in~~ ~~in~~

I applied for admission to the Technische Hochschule of Berlin-Charlottenburg. This permission I finally got, but not without difficulty and not without having to bring to bear all the pressure I could through such private connections as I was able to muster in the city of Berlin.

Rosenfeld IV  
cont'd

Berlin at that time lived in the heydays of physics. Einstein  
at the Prussian Academy of Sciences;  
was there, Max Planck and Von Laue were at the University of Berlin,  
and so was Walter Nernst; and Fritz Haber was at that time director  
of one of the Kaiser Wilhelm Institutes. Engineering attracted  
me less and less and physics attracted me more and more, and  
finally the attraction became so <sup>great</sup> big that I was physically unable

to listen to any of the lectures through which I sat more or less impatiently at the Institute of Technology. [Technische Hochschule of Berlin - Charlottenburg]

Even though all arguments by the conscious spoke in favor of getting a degree in engineering rather than getting a degree in physics, whatever considerations went on, on the subconscious level, argued for the opposite. In the end, as always, the subconscious proved stronger than the conscious, and ~~it~~ made it impossible for me to make any progress in my studies of engineering. Finally the ego gave in, and I left the Technische Hochschule to complete my studies at the University, some time around the middle of '21.

A student of physics had in those days in Berlin great freedom. Boys left high school when they were eighteen years old. They were admitted at the University without any examinations. There were no examinations to pass for four years, during which time the student could study whatever he was interested in. When he was ready to write a thesis, he either thought of a problem of his own or he asked his professor to propose a problem on which he could work. At the better universities, and Berlin belonged to them, a thesis in order to be acceptable, had to be a piece of really original work. If the thesis showed the student to be really able, and was accepted, the student <sup>then</sup> had to pass an oral exam.

Stevette  
 from 1963 tape  
 as retyped 1967

Let me tell you, maybe, the story of my Doctor's thesis. I had this problem which von Laue gave me but I couldn't make any headway with it. As a matter of fact, I was not even convinced that this was a problem that could be solved, and I forced myself to work on it, but it just wouldn't go at all. And this went on for about six months. Then came Christmas 1921, and I thought Christmas time is not a time to work, it is a time to loaf, and so I thought I would just think whatever comes to my mind. And pretty soon things began to come into my mind, in a field completely unrelated to the theory of relativity, and within three weeks I had produced a manuscript of something which was really quite original. But I didn't dare to take it to von Laue, because it <sup>was</sup> is not what he asked me to do. There was a seminar for students which Einstein held at that time, which I attended, and after one of these seminars, I went to him and said that I would like to tell him about something I had been doing, and he said, "Well, what have you been doing?" And I told him what I <sup>had</sup> have done. And Einstein said, "That's impossible. This is something that cannot be done." And I said, "apparently no, but I did it." So he said, "How did you do it?" Well, it didn't take ~~for~~ him five ~~minutes~~ or ten minutes to see, and he liked this very much. So this then gave me courage and I took the manuscript to von Laue. I remember that I caught him as he was about to leave his class and I told him that while I <sup>hadn't written</sup> ~~didn't do~~ ~~write~~ the paper which he wanted me to write, I wrote something else; and I wondered whether he might be willing to read it, and tell me whether this could be used perhaps as my dissertation for my Doctor's degree. and he sort of looked somewhat quizzically at me, but he took the manuscript and next morning, early in the morning, the telephone rang. It was von Laue who said, "Your manuscript has been accepted as your thesis [note] for the Ph. D. degree."

The subject, well, up to the time that I wrote this thesis, it was generally believed that the laws which govern the thermodynamical fluctuations must be derived from mechanics and that they transcend what is called the second law of thermodynamics. And I showed that the second law of thermodynamics was much more than just a statement about the average values; it also covers the <sup>laws</sup> ~~loss~~ which governs the fluctuations - the thermo-dynamic fluctuations. Now this was not really the beginning, it was not the

cornerstone of a new theory, it was rather the roof of an old theory. However, about six months later, I wrote a little paper on a rather closely related subject; it dealt with the problem of what is essential in the operations of the so-called Maxwellian demon, who guesses right and then does something, and by guessing right and doing something, he can violate the second law of thermodynamics. ~~And~~ this paper was a radical departure in thinking, because I said that the essential thing here is that the demon utilizes information to be precise information which is not really in his possession, because he guesses it. And <sup>I said</sup> that there is a relationship between information and entropy, and I computed what this relationship was. Now, (this paper no one has paid any attention to), until, after the war, information theory became fashionable. Then the paper was rediscovered and now this old paper, to which I would think for over 35 years, nobody paid any attention, is a cornerstone of a modern information theory.

(note)

~~Question: What is information theory?~~

~~... the theory is embodied in my doctor's thesis.~~ <sup>In those days-</sup> Yes, I went for long walks and I saw something in the middle of the walk, and when I came home I wrote it down, and next morning I woke up with a new idea and I went for another walk, and it crystallized in my mind, and, in the evening I wrote it down. Well, it was an onrush of ideas, all more or less connected, which just kept on going until I had the whole theory fully developed. It was a very creative period, In a sense, the most creative period in my life, where there was a sustained production of ideas.

P

..... ~~No, that was considerably later.~~ <sup>In</sup> This was maybe 1928 or 1929, ~~when~~ I began to think what might be the future development of physics. Disintegration of the atom required higher energies that ~~were~~ available up to that time. There ~~has~~ <sup>had</sup> been no artificial disintegration of the atom, and I was thinking of how could one accelerate particles ~~with~~ ~~to~~ ~~high~~ ~~speeds~~, and I hit upon the idea of the cyclotron, maybe a few years before Lawrence, and I wrote it down in the form of a patent application which was filed in the German patent office. It was not only the general idea of the cyclotron, but even the details of the stability of the electron orbits, and what it would take to keep these orbits stable, all this was worked out on this occasion. [note]

*During this period.*

..... Yes, Einstein and I had an idea of how to pump liquid <sup>metals</sup> matters, and this we patented also, again in Germany, and we wanted to use it to make a household refrigerator without moving parts and, as a matter of fact, we built one refrigerator which was based on this principle. It was not very practical, because mechanical refrigerators which have moving parts function really quite well and are not too noisy, and so this principle of pumping liquid <sup>metals</sup> matters had no application until atomic energy came along. But then, you see, after the war, they began to build pumps of this sort, and they are really quite useful.

A. Berlin, 1920-1933 (6)

Notes

Notes to p. 15 ~~(Youth Section)~~

Szilard's Ph. D. degree was granted Cum Laude by the University of Berlin on August 14, 1922. The thesis was published in 1925: "Über die Ausdehnung der Phänomenologischen Thermodynamik auf die Schwankungserscheinungen," Zeitschrift für Physik, 32:753-788 (Heft 10), 1925.

xerox of Ph.D. attached

K.W.

Notes to p. 16 (~~Youth section~~)

"On the Decrease of Entropy in a Thermodynamic System by the Intervention of Intelligent Beings," by Leo Szilard. Zeitschrift für Physik, 53: 840-856, 1929.

This paper was translated from German into English and published posthumously in Behavioral Science, 9:301-310 (Oct.) 1964.

Szilard's cyclotron patent application was filed in the German patent office on January 5, 1929 (Application No. S 89288 VIIIa/21g).

A few weeks earlier, on December 17, 1928, he had filed an application describing a linear accelerator for particles (Application No. S 89028 VI/40c).

Techn. Hochschule Berlin Abgangzeugnis  
datiert Nov 4, 1920

K.W.

Notes to p. 17 (Youth-section)

Szilard and Einstein were joint holders of seven German patents covering pumps, liquid metal pumps, and refrigerator systems using them. These were dated from 1927 to 1930. In addition, Szilard held some dozen other German pump and refrigeration patents, granted during the same period.

K.W.

Abgangszeugnis

Herr *Leo Szilard*  
geboren den *11. Februar* 1898 zu *Budapest*  
ist auf Grund des *Zeugnisses der Reife von der Oberrealschule*  
*des VI. Bezirkes zu Budapest*  
vom *27. Juni* 1916 am *9. Februar* 1920 als Studierender  
der Technischen Hochschule unter Nr. *27974* immatrikuliert und bei der Abteilung für

*Wappstein-Industriemaschinen*  
eingeschrieben worden.

Er hat hier *zwei* Semester studiert.

Das auf Grund des vorgelegten Anmeldebogen von dem Sekretariat beglaubigte Verzeichnis der angenommenen Vorträge und Übungen befindet sich umstehend. — Die Führung des Herrn Studierenden hat zu Bemerkungen *keine* Veranlassung gegeben.

Charlottenburg, den *4. November* 1920.



Der Rektor

*Schorn*

# Verzeichnis der angenommenen Vorträge und Übungen

Bezeichnung des Unterrichts	Name des Dozenten	Bemerkungen
<u>I Winter- Halbjahr 1920.</u>		
1. Hauptvorlesung Elektrotechnik	Orlich	
2. Elektrotechnische Werkkünde	Orlich	
3. Übungen im Elektrotechnischen Laboratorium	Orlich	
4. Kolbenpumpenmechanik	Stumpf	
5. Antriebsmechanik	Riecher	
6. Wärmekunde II	Fosse	
7. Elektrische Kraftanlagen und Leistung	Reichel	
8. Gas- und Dampfmaschinen- und Turbinen- mechanik	Fassbender	
9. Kupfer- und Zinkverhüttung	Frauz	
10. Metallkunde Laboratorium	Fosse	
11. Grundvorlesung für Volkswirt. Ingenieure	Wolf	
12. Hauptvorlesung Elektrotechnik III	Orlich	
13. Höhere Metallkunde, mit Übungen	Fuchs	
14. Metallkunde, mit Übungen	Hammerer	
15. Kolloquium über Metallkunde	Hammerer	
16. Größere Botanik	Lichtenstein	
17. Vorkurs für Zoologie II	Lejny	
<u>II Sommer- Halbjahr 1920.</u>		
18. Metallkunde, mit Übung	Hammerer	

Bezeichnung des Unterrichts

Name des Dozenten

Bemerkungen

- 19. Volkswirtschaftslehre Wolf
- 20. Festungsvergleichungen Lichtenstein
- 21. Volkswirtschaftslehre Gelhoff
- 22. Hygieneprüfungsaufgabe Orlich
- 23. Übungen im Volkswirtschaftslehre  
Lehrbuchwissen II Orlich
- 24. Übungen im Volkswirtschaftslehre  
Lehrbuchwissen II Füsse
- 25. Übungen im Volkswirtschaftslehre  
Lehrbuchwissen Wedding
- 26. Geographie Kumpff
- 27. Volkswirtschaftslehre I Floss
- 28. Volkswirtschaftslehre I  
Lehrbuchwissen Reichel
- 29. Volkswirtschaftslehre I Wedding
- 30. Hygiene und Infektion, mit Übung Fraury
- 31. Volkswirtschaftslehre I, mit Übung Feyn
- 32. Hygieneprüfungsaufgabe I Füsse



Langenbrigh

Preuder

Abwehrklausur

Humboldt-Universität zu Berlin

Archiv

Berlin W 8, Unter den Linden 6

Berlin, den 2.10.56

- A 08/56 -

Herrn Professor

Leo Szilard

The University of Chicago

Chicago 37, Illinois

Betr.: Tätigkeit als Assistent am Institut für theoretische Physik  
Bezug: Ihr Schreiben an den Herrn Rektor vom 5.9.1956

Sehr geehrter Herr Professor,

von der Kader-Abteilung wurde uns Ihr Schreiben zugeleitet, da in Ihrer Personalakte die Assistententätigkeit nicht vermerkt ist.

Auf Grund der Angaben in Ihrem Habilitationvorgang bestätigen wir, dass Sie seit Ende des Jahres 1924 (genaues Datum ist nicht zu ermitteln) bis zu Ihrer Habilitation am 17.5.1927 als Assistent am Institut für theoretische Physik an der Universität Berlin tätig gewesen sind.

Hochachtungsvoll

  
(Göber)

Humboldt-Universität zu Berlin

Archiv

Berlin W 8, Unter den Linden 6

Berlin, den 10.7.1956

- A 07/56 -

Herrn  
Professor Dr. Leo Szilard  
The Quadrangle Club  
The University of Chicago  
Chicag o 37, 111

Betr.: Tätigkeit als Privatdozent an der Universität Berlin  
Bezug: Ihr Schreiben vom 27.6.1956

Sehr geehrter Herr Professor,

hiermit bestätigen wir Ihnen, dass Sie sich am 17.5.1927 in der Philosophischen Fakultät der Universität Berlin für Physik habilitiert haben.

Am 23.11.1933 wurde Ihnen auf Grund einer Verfügung des Preuss. Ministers für Wissenschaft, Kunst und Volksbildung die Lehrbefugnis entzogen.

Hochachtungsvoll

  
(Göber)

Kaiser-Wilhelm-Gesellschaft zur Förderung der Wissenschaften

Berlin S. 2, den 5. April 1924.  
Schloß, Portal II  
Telephon Amt ~~123456~~  
Merkur 686

Ihrer Hochwohlgeboren beehre ich mich mitzuteilen, dass das vom  
Kaiser Wilhelm-Institut für Physik gewährte Stipendium bis zum  
Ende des kommenden Sommersemesters (1.8.24) bewilligt worden ist.  
Die Beträge werden an den für die Beamtengelder festgesetzten  
Terminen überwiesen werden.

In ausgezeichnetster Hochachtung



Geschäftsführendes Mitglied  
des Verwaltungsausschusses.

Seiner Hochwohlgeboren

Herrn Dr. S z i l l e r d o

Eln.-Danl em.

Kaiser Wilhelm Institut  
für Physik

Zehlendorf, 13.6.24.

Sehr geehrter Herr Dr. Szilard!

Falls Sie das Forschungsstipendium des Kaiser Wilhelm Institutes für Physik, welches Sie beziehen, noch weiter zu haben wünschen, so bitte ich, einen Antrag auf Verlängerung über den 1. August hinaus mit kurzer Begründung noch im Laufe des Juni bei mir einzureichen.

Mit vorzüglicher Hochachtung

*M. v. Lame*

stellv. Direktor des Kaiser Wilhelm  
Institutes für Physik

Kaiser Wilhelm Institut  
für Physik

Zehlendorf, 6.7.24.  
Albertinenstr. 17.

Sehr verehrter Herr Doktor!

Das Direktorium des Kaiser Wilhelm Instituts für Physik hat in seiner Sitzung am 3. ds. Mts. Ihren Antrag auf Verlängerung des bisher gewährten Forschungsstipendium bis zum 31. März 1925 bewilligt. Vorausgesetzt dabei ist natürlich, dass Sie in dieser Zeit nicht eine Assistentenstelle oder etwas Ähnliches erhalten.

Mit vorzüglicher Hochachtung

*M. v. Lame*

stellv. Direktor des Kaiser Wilhelm Instituts  
für Physik

Dr. Leo Szilard  
1155 East 57th Street  
Chicago 37, Ill.  
U.S.A.

14. Dezember 1957

An den  
Herrn Rektor der Humboldt-Universität  
B e r l i n

Sehr geehrter Herr Rektor!

Ich waere Ihnen sehr dankbar, wenn Sie mir eine Information in folgender Frage geben könnten, die ich zu einem Antrag auf Festsetzung meiner ruhegehaltstfähigen Dienstzeit benötige:

Ich wurde Ende 1924 zum Assistenten am Institut fuer Theoretische Physik der Friedrich-Wilhelm-Universität ernannt. Dieses war die einzige Assistentenstelle an diesem Institut und sie bestand seit sehr vielen Jahren.

Die Information, die ich benoetige ist nun, ob diese Assistentenstelle eine etatmäßige war.

Fuer Ihre frdl. Mühe im Voraus dankend,

Ihr sehr ergebener,

Leo Szilard.