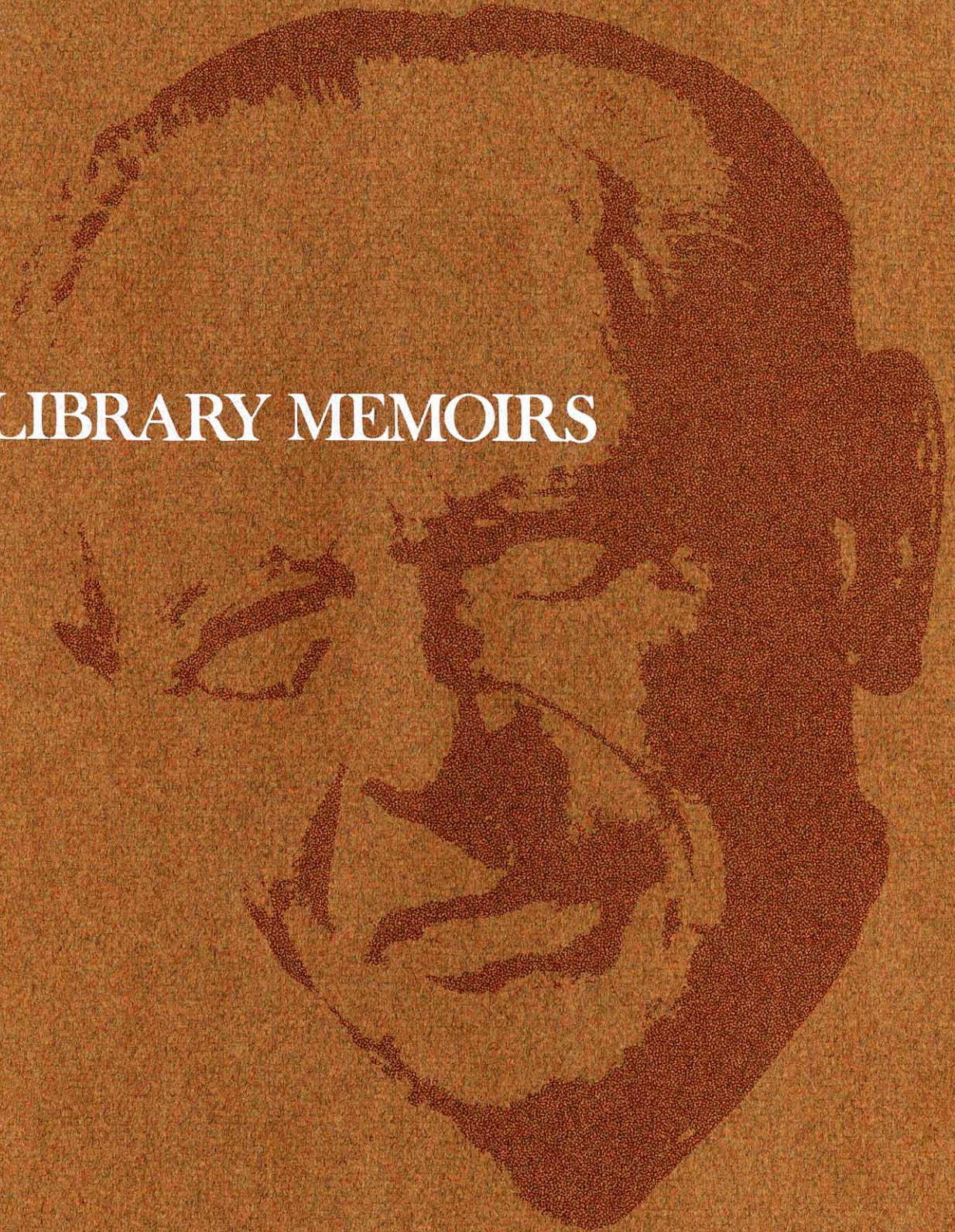


TERZAGHI LIBRARY MEMOIRS



Karl Terzaghi in August, 1957 visiting Loen in Norway, the area where several rockfalls have occurred. The most serious took place in 1936, when 73 persons were killed by the 74 meter high flood wave caused by the slide.



The Terzaghi Library

By Laurits Bjerrum and Unni Øiseth

KARL TERZAGHI

HON. M. AM. SOC. C. E., BOSTON SOC. C. E.; M. INST. C. E.

3 ROBINSON CIRCLE WINCHESTER MASSACHUSETTS

October 2, 1964.

Wife

In the event of my death:

My body should be cremated, and no services or rites should be held on account of my profound dislike for ceremonies of this kind. My ashes should be buried in South Waterford where I have spent with you many happy days, and a simple Tablet should be erected with the following inscription:

Karl Terzaghi

a civil engineer

born October 2, 1883, in Prag, Austria and died -----

He has lived without compromising, served his chosen profession to the best of his abilities and died without having anything to regret.

After my departure Bjerrum should be invited to come to Cambridge, with all expenses to be paid out of my estate and collect the items which I have selected for the T. Library in Oslo. During his sojourn you should invite our him and our intimate friends to a party to rejoice on the fact that I was granted, and you have shared, a long and wholesome life which I was able to live without humiliating compromise, in accordance with my innate pattern. There is nothing to feel sorry about it, because the end is an essential and inevitable part of the existence of our species.

Lovingly yours

Dean.

Karl Terzaghi's last will given in the form of a letter to his wife.

The Terzaghi Library was officially opened in 1967, so it is high time that it should be properly introduced to the public.

The Terzaghi Library is first of all a *memorial library* created in honour of the founder of the science of soil mechanics: *Karl Terzaghi*. The greatest part of the library is made up of material given to us by Karl Terzaghi himself. Our main responsibility is therefore to take care of this collection and make it accessible to future generations. Secondly the Terzaghi Library is intended to be an *active center* where people from all over the world may come to work and study. In addition the library is now about to be extended to include an *historical library* up to the year 1948.

"Why was the Terzaghi Library founded in Norway, instead of in Austria where Karl Terzaghi was born, or in the United States where he lived most of his adult life?" — This is a question we often hear. So let the story be repeated as it was told at the Terzaghi Memorial Session of the 6th International Conference on Soil Mechanics in Montreal, 1965.*

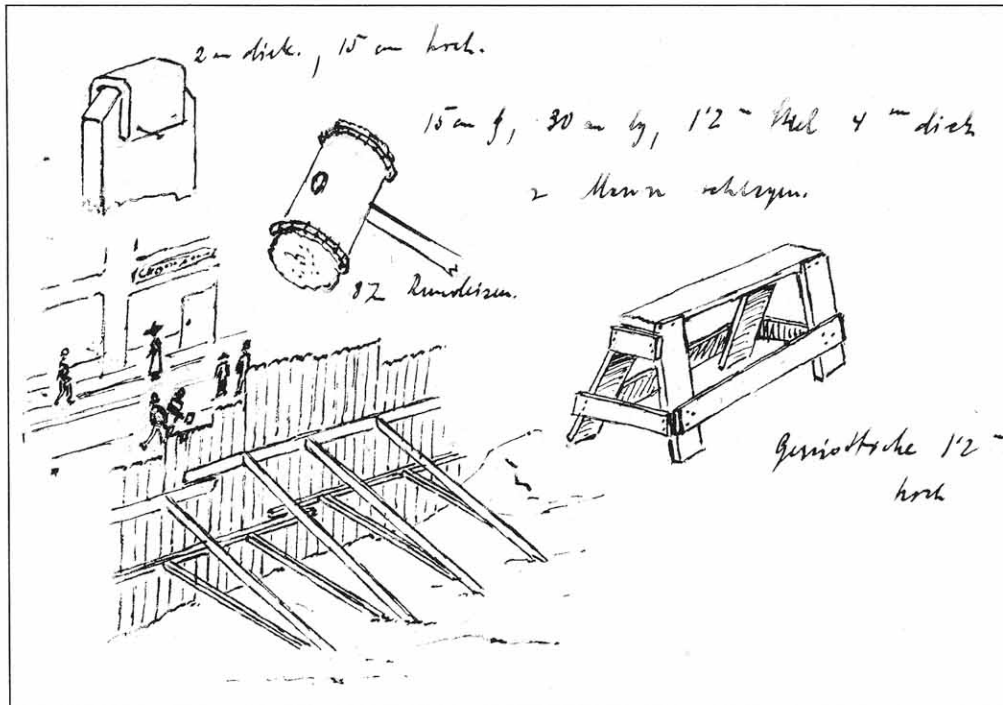
* L. BJERRUM. Opening session in Honour of Karl Terzaghi. International Conference on Soil Mechanics and Foundation Engineering, 6. Montreal 1965. Proceedings, Vol. 3, p. 78–79.

"The story of how the idea of a Terzaghi Library was born starts as early as the fall of 1957. I was on my way to Yugoslavia when I stopped for a couple of days in Vienna to see Terzaghi's old laboratory and visit his successor at the Technische Hochschule, the late Professor O.K. Fröhlich. Fröhlich was just retiring at the time of my visit and he was busy removing all his papers in order to make his office ready for his successor. During our tour through the University we stopped in Terzaghi's old office, and here Fröhlich took me into a small filing room and showed me a large pile of dusty papers on the floor in one of the corners. He explained to me that this material was left by Terzaghi when he left Vienna hurriedly, shortly after the 'Anschluss' in 1938. The material had remained in the filing room for these many years and Fröhlich now asked me to advise him on what to do with it, as he hesitated to throw it away.

A quick look at the papers showed that they contained manuscripts, reports, and correspondence dating back as far as 1910, and that they included, for instance, material from Terzaghi's early work in Istanbul. I asked Fröhlich to keep the material until I had been in contact with Terzaghi and had received his personal instructions. In a letter to Terzaghi I pointed out that this material could prove invaluable for future generations. I offered to try to arrange to have the most valuable part sorted out and sent to him in the United States. As a result of our correspondence the material was sent to Oslo, where we performed the screening process and prepared a list of contents so that Terzaghi himself could

decide which papers he was interested in having sent to the United States.

Out of this accidental occurrence grew the idea of a Terzaghi Library. Terzaghi realized that his papers and reports were of a general interest. He asked us to keep the Vienna material and, in full agreement with his wife, Ruth Terzaghi, he decided in 1958 that the material collected in the United States should also be included in the Terzaghi Library after his death, and that this library should be established in Oslo."



Sketch from Karl Terzaghi's first trip to the United States in 1912 and 1913, taken from his notebook "Adaptierungs-, Demolierungs- und Pöhlungsarbeiten".

6

More than perhaps any other science, the science of soil mechanics is the result of the effort of one man. With modest facilities, and under difficult circumstances, Karl Terzaghi laid the foundation of the new science during the years 1919–1925. Until his death in 1963, less than a month after his eightieth birthday, he stood in the front rank amongst the world's most famous soil mechanics scientists and was counted as one of the most prominent civil engineers of this century.

To give an idea of the type of material included in the Terzaghi Library, we have

selected some examples, referring to various periods of Terzaghi's life.

From A. Casagrande's biography published in the Terzaghi Anniversary Volume** it is known that Terzaghi's first attempt to reach a rational approach to earthwork and foundation engineering was based on the idea that it might be possible to correlate construction experience with the geology of the soil and rock involved. He hoped to be able to do this on the basis of experience accumulated in the United States, and he spent the years 1912–1913 travelling to dam sites and foundation jobs all over the

United States. All his *notes*, hand-drawn *sketches*, and *reports*, arranged and interpreted according to the type of problem, were among the material found in Vienna.

This attempt was a discouraging failure and Terzaghi had to give up this line of attack on the problem. The following years, which coincided with the First World

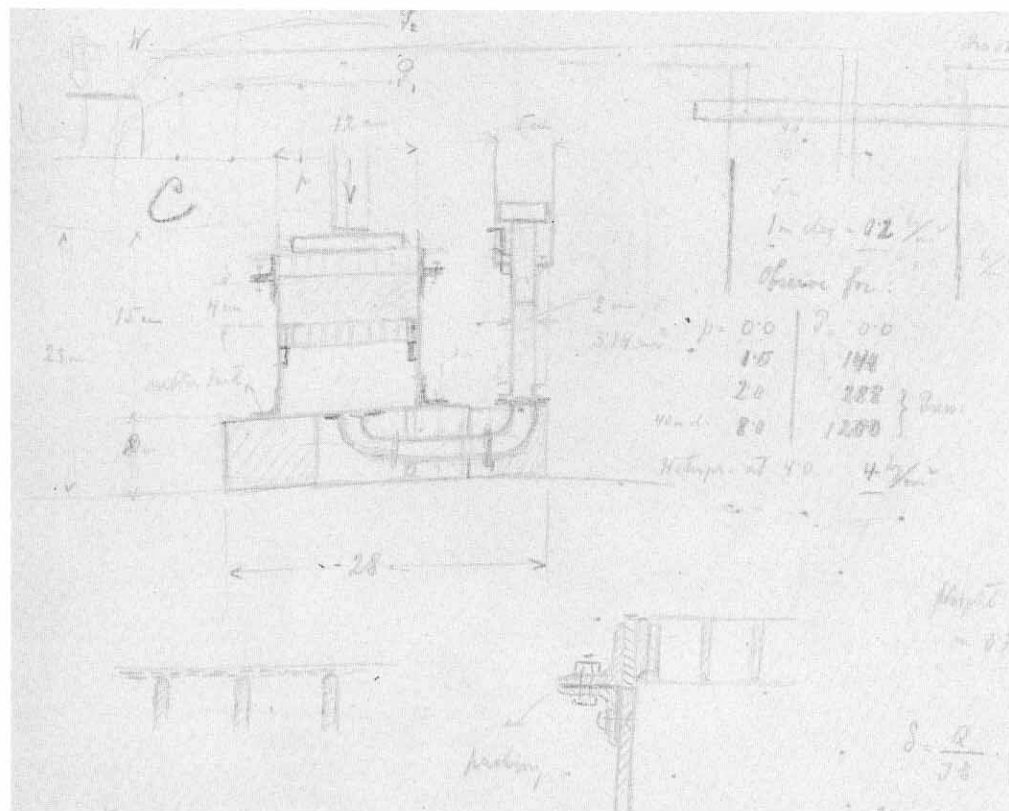
** From Theory to Practice in Soil Mechanics, Selections from the Writings of Karl Terzaghi. New York, Wiley, 1960. 425 p.

War, represented a restless and unsettled period in Terzaghi's life. We can follow this in some of the most fascinating documents in the Library, a collection of 28 *Letters to Professor Wittenbauer*. Wittenbauer was a well-known professor at the Technische Hochschule in Graz, where Terzaghi had been a student. As a student Terzaghi took such full advantage of "academic freedom" that he came close to being expelled. From this fate he was saved by Professor Wittenbauer, who called the attention of his colleagues to the fact that the only three students that ever had been expelled from the Technische Hochschule in Graz since it had been founded, had become some of the most famous engineers originating from the university, as for instance Prof. Riegler, who pioneered the development of the steam turbine. The letters to Wittenbauer, which cover the period from 1909 to 1920, permit a deep insight into those soul-searching years of Terzaghi's life and his search for meaningful goals.

This period of searching ended abruptly on a day in March 1919. As Terzaghi has told the story, he was sitting in a mood of depression on a piece of rock outside Robert College in Istanbul. The First World War was over and, like all citizens of the defeated nations, he had been dismissed from his position at the Imperial School of Engineers. In order to survive, he had been obliged to accept a poorly paid teaching job at Robert College. When sitting outside the College looking out over the Golden Horn, he suddenly visualized what was needed to obtain a rational approach to the problems involved in earthwork and foundation engineering. He realized that prog-

ress depended entirely on the development of testing equipment and methods which could give a quantitative measure of the mechanical properties of the soils involved. On some *sheets of paper* he listed a number of possible ways of testing soils, made sketches of the equipment needed, and suggested how the results could be inter-

preted. These sheets of paper represent the birth of soil mechanics. Terzaghi emphasized several times their importance to the Terzaghi Library. However, he never showed them to any one and even Mrs. Terzaghi had never seen them until they were found after Terzaghi's death, at the bottom of a shoe-box filled with notebooks.



Design for oedometer-permeameter, sketched by Terzaghi in March 1919, as part of his draft of a program for the science of soil mechanics.

30. X. - 3. XI. Die Identität in thermodynamischen Vorgänge & des Verdichtungs-
 process erkannt. Nach repetitiven Versuchen, die partiellen Differentialgleichungen
 zu lösen studierte ich, Ingersoll - 20th, Mathematical theory of heat conduction,
 Simon & Co. Boston N.Y. ¹⁹¹³ & An Introduction to mathematical physics. R. A.
 Hoarstrom. Longmans, Green & Co. V. 39 Paternoster Row, London. ¹⁹¹² 1912
 5. XI Formeln für 4 Probleme in thermodynamischen Vorgängen

Excerpt from the diary – October 30th, 1923 –
 the day that Karl Terzaghi discovered the analogy
 between heat conduction and pore pressure dis-
 sipation and thereby solved the problems of the
 consolidation of clays.

From that day, in March 1919, Terzaghi's
 life changed completely. His restlessness
 and indecision vanished. He had now found
 the subject into which he could throw
 all his ingenuity and imagination. The
 progress of this work was unbelievable.
 It is our good fortune that we can follow it
 from day to day. At the beginning of April,
 1919, Terzaghi started a *diary* in which he
 entered what he had accomplished each
 day, the main results of his testing, and
 ideas and suggestions which he considered
 important to remember. From this diary
 we know, for instance, that the first consol-
 idation test on a clay had already been
 carried out in May, 1919, and that it was on
 October 30th, 1923, that Terzaghi solved
 the mathematical problems involved in the

theory of consolidation by discovering the
 analogy with the process of heat conduc-
 tion. This diary was – with minor inter-
 ruptions – kept until his death. At the end
 of each year, he wrote a short summary of
 what the year had meant to him. In
 addition he kept a second set of records.
 This was not a systematic diary, but an
 occasional record of his thoughts on life.
 These notes are, we think, almost of
 literary value, giving a picture of Terzaghi
 himself and the world surrounding him.
 Terzaghi also wrote an *autobiography*, cov-
 ering his life from his childhood to 1939.

In this connection we should also men-
 tion a unique gift of three books that we
 recently received from Terzaghi's sister. The
 three volumes (the only remaining ones out

of seven) contain the letters that Karl Terzaghi wrote to his mother during the years 1912, 1928–1932 and 1936. All these were carefully copied by his mother and saved together with the postcards and newspaper clippings that he sent her.

It is of special interest to follow the development of the new science of soil mechanics from Terzaghi's first primitive experiments in 1919 to its successful application to practical problems. In the handwritten manuscripts of his *lectures* in the United States and in Vienna, in the notes for the papers he gave to engineering societies, and in the manuscripts of 2 *unpublished books* which he worked on in the mid-thirties, we can read the story of how the original ideas were formulated into consistent concepts, and how these again were applied to engineering problems. The extensive *correspondence* with leading engineers all over the world illustrates the impact of Terzaghi's work on the profession.

Above all, the most valuable part of the Library is an almost complete collection of material on Terzaghi's *consulting jobs*. This includes his reports, notes, correspondence, memoranda, and instructions for the important and difficult construction work with which he was connected. It starts in the early 'twenties in Istanbul, includes his first assignments in the United States in the late 'twenties, and the period of extensive consulting work during the years in Vienna with dams in the U.S.S.R. and in North Africa. Most complete are the files from the work of the last three decades in the United States, starting with the Chicago Subway and terminating with the Mission



Dam — renamed Terzaghi Dam in 1965. These files represent an invaluable source for a study of the application of soil mechanics and engineering geology to practical problems and, in contrast to Terzaghi's own publications about the jobs, they give the full story of how the problems were attacked.

*Terzaghi on the job.
Terzaghi and Dr. R. Peck at
Lake Maracaibo, Venezuela.*



Example from the collection of photographs in the Terzaghi Library.

During the First World War, Karl Terzaghi served for some time in the Austrian Airforce jointly with von Karman and von Mises.

Beside all the written material, the Terzaghi Library also includes quite a large collection of *photographs*, both technical and personal. The library has in its possession many of Karl Terzaghi's *medals* and *honours* which included eleven honorary doctorates. The beautiful collection of valuable old *prints*, that were given to Terzaghi on his 70th birthday by the Institution of Civil Engineers in London, should also be mentioned.

To encourage and aid those who are interested in spending some time in the Terzaghi Library in order to devote themselves to a special problem or an epoch of Karl Terzaghi's life and work, the *Terzaghi Library Fellowship* has been established. The Fellowship consists of a money grant covering the expenses of travelling and of a stay in Oslo for about two months. The type of study which the Fellow is expected to undertake will depend upon his interests, previous experience, knowledge of language etc. The Fellow is required to summarize the result of his work at the Terzaghi Library in a report.

The Terzaghi Library Memoirs, of which this is the introductory number, will be issued at irregular intervals. They will contain selections from the material in the Terzaghi Library, Terzaghi Library Fellowship reports, biographical articles about Karl Terzaghi, and other material that is considered relevant to the Terzaghi Library. It may also include material bearing some relation to the planned historical extension of the Terzaghi Library. For instance, it is our hope to publish papers about the history of soil mechanics and foundation engineering or to reprint as facsimile old, rare papers of general interest.

We hope that this description has shown that the Terzaghi Library is a unique treasure. The Library tells the complete story of the birth and growth of a science, and of its ingenious father. There is no need to emphasize that our small country is proud of the assignment to take care of this material, and we shall do our utmost to preserve it and give it the setting it deserves. We appreciate fully that our country is only the host country and that the Terzaghi Library is the true property of our profession and our International Society of Soil Mechanics. The Terzaghi Library has therefore been established as an independent institution and its statutes are formulated such that its integrity will be preserved for the future.

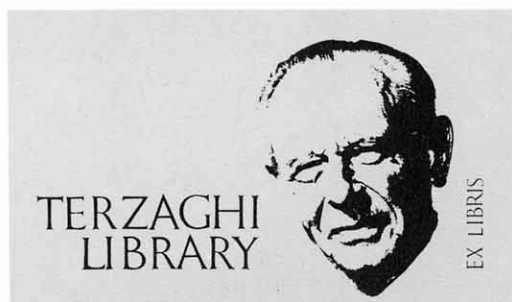
Let us end this paper by mentioning that we would be very pleased and grateful to receive as donation material relevant to Karl Terzaghi, his life and work, or to the historical library.



Mrs. Ruth Terzaghi with son and daughter in the Terzaghi Library summer 1958.

*The Terzaghi Library Memoirs are issued irregularly
by the Norwegian Geotechnical Institute, and cover
the field of the history of soil mechanics and
foundation engineering*

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