

SUOMEN GEOLOGINEN  
TOIMIKUNTA

GEOLOGISKA KOMMISSIONEN  
I FINLAND

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BULLETIN  
DE LA  
COMMISSION GÉOLOGIQUE  
DE FINLANDE

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N:o 112

JAKOB JOHANNES SEDERHOLM

BIOGRAPHIC NOTES AND BIBLIOGRAPHY

BY  
VICTOR HACKMAN

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WITH A VIGNETTE

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HELSINKI  
OCTOBRE 1935

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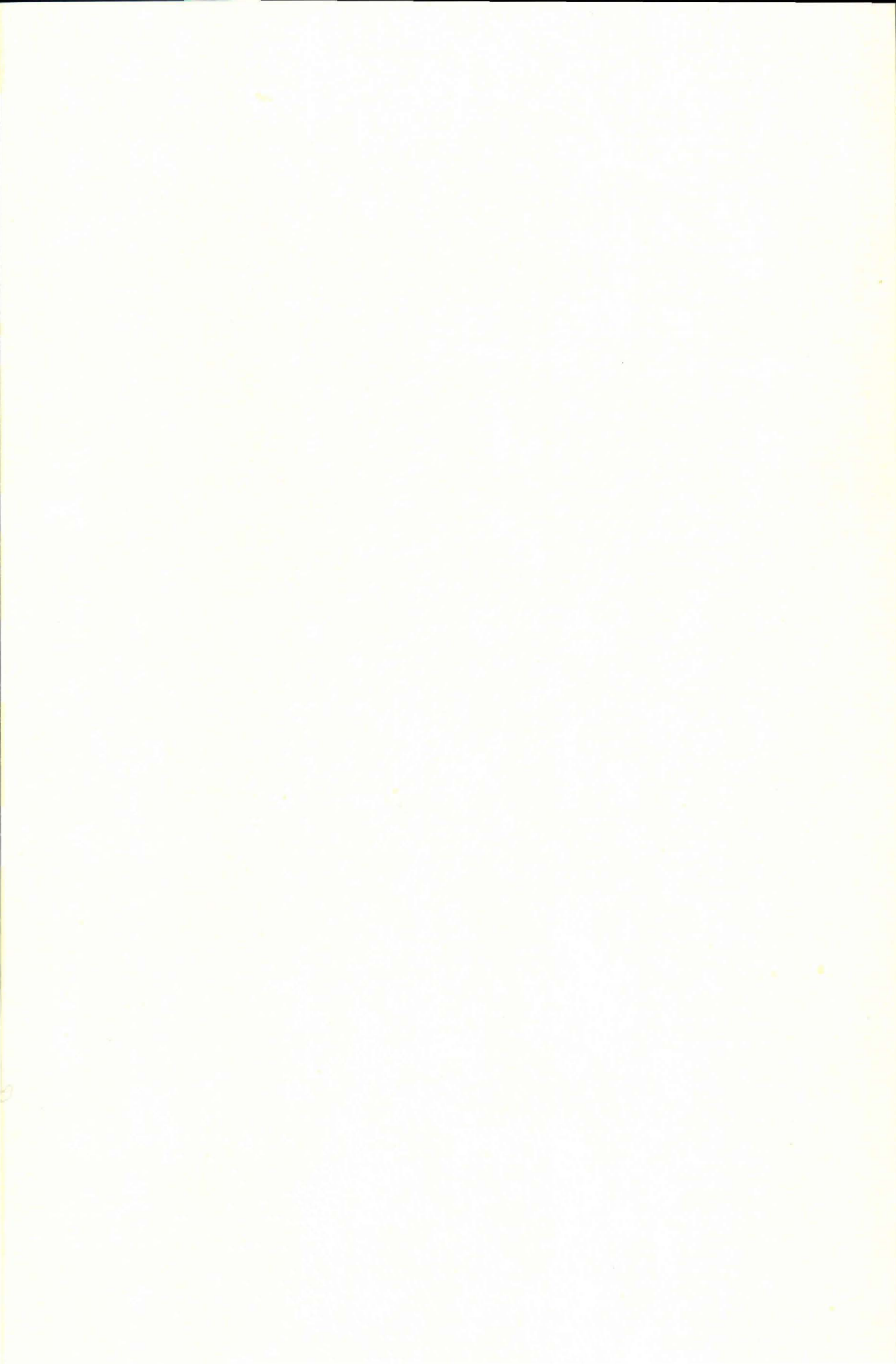




*J. J. Sederholm*

\* 20. VII. 1863. † 26. VI. 1934.





On June 26th, 1934, Professor J. J. Sederholm, during more than forty years Director of the Geological Commission in Finland, died in Helsinki (Helsingfors) at an age of almost seventyone. His death evoked deep regret in all who knew him and not only his own country lost one of its best men and most prominent geologists; in almost the whole world geologists deplored his decease, being aware that his death meant the loss of a scientist, whose work was of remarkable importance for the culture of the world.

Jakob Johannes Sederholm was born in Helsinki on July 20th, 1863. He was the third of eight children of Claes Theodor Sederholm and Maria Sofia Christina (Blomquist) Sederholm. His father, who was the owner of a printinghouse, was interested in journalistic work and was one of the founders and editors of the »Helsingfors Dagblad», at that time the main daily paper of his native town; he also took part in other publishing attempts, and Fine Arts is said to have been one of his favorite subjects.

The ancestors of Johannes Sederholm came over from Sweden to Finland in the eighteenth century. Several of them were remarkable for their literary talents, and among them Karl Sederholm (1789 to 1867) passed a great part of his life in Russia, where he did duty as a Rector in the Evangelic Church at Moscow. He wrote a dissertation under the title »De philosophia cum religione christiana connectenda», where he attempted to combine philosophy with the Christian religion. The General Karl Robert Sederholm, a nephew of the abovenamed Karl S., who lived from 1818 to 1903, also showed literary and artistic tastes. He was an Engineering Officer in Russian service and, since 1883, chairman of the Russian Board of Engineering in Helsinki. When he was getting old he spent a great part of his time in writing religious philosophical essays. Perhaps it was owing to family tradition that the taste for literary work and a philosophical turn of mind were predominant in Johannes Sederholm.

After the usual school training, Johannes Sederholm entered the University of Helsinki in 1882. To begin with he studied philosophy and was so ardent a student that he soon got overstrained because of his rather delicate nerves and frail health. Then, following his doctor's advice, he left the study of philosophy and instead of

it chose geology for the object of his studies, thereby getting the opportunity, afforded by the geological field work, of a more healthy occupation in the open air. He soon became as much interested in this study as he had earlier been fascinated by philosophy, and so it happened, in the course of time, that the young philosopher became a distinguished geologist, famous far beyond the borders of his own country. Nevertheless, as his cousin and friend, the far famed Sociologist Professor Edward Westermarck, remarked at the funeral of Johannes Sederholm, »the philosopher remained for ever in the geologist Sederholm».

After having graduated and become a Bachelor of Arts (filosofie kandidat), in 1883, Johannes Sederholm went to Stockholm in order to continue his geological studies under the guidance of the eminent Norwegian Professor W. C. Brögger at the Stockholm High School. The famous teacher introduced him to all the secrets of modern geology removing all antiactualistic ideas that might possibly have survived in his pupil's mind since the earlier time of his geological studies when, at the University of Helsinki, Professor F. J. Wiik, a decided antiactualist, was his teacher. Sederholm's nearest fellow-student in Stockholm was his countryman and friend Wilhelm Ramsay, to whom he always remained united by the ties of a most intimate friendship until the premature death of Ramsay, in 1928.

Sederholm's intention had been during his stay in Stockholm to finish his Doctor's dissertation, to which he had gathered the material from the Finnish rockground. Unfortunately he failed in this purpose because of his frail health, from which he had suffered already during earlier years in Finland. A great part of his sojourn in Stockholm he passed in a hospital. Occasionally his physical condition seemed to be utterly reduced, so his doctor thought he would never recover. Nevertheless, he fortunately regained his health and soon returned to Finland again. But during the whole of his lifetime, he had ever and again to struggle against his frail constitution, and it was only thanks to the healthy life he led as a geologist and to his strength of will in resisting all the hardships of geological field life, that he could steel his constitution and attain the high age of seventy.

Shortly after his return from Stockholm, Sederholm was, from 1886 to 1887, Extraordinary Assistent in the Mineralogical Institution of the University of Helsinki and, in 1887, was appointed Geologist to the Geological Commission. During the earliest time of his appointment he published some papers dealing partly with Quaternary geology and partly with the rockground of Finland. Besides these papers



he also edited some map-sections, with descriptions, belonging to the Geological Survey of Finland.

Sederholm's second trip abroad, for the purpose of study, occurred in 1890—1891. This time he went to Heidelberg; under the guidance of the famous Professor H. Rosenbusch he there pursued petrological studies. Through this skilful teacher he got a thorough insight into modern petrographical theories, set up by Rosenbusch himself, as well as into the use of the petrographical microscope. Now he also availed himself of the opportunity of finishing his Doctor's Dissertation which he had begun in Stockholm. At the same time he improved his geological experiences by undertaking excursions not only in Germany, but also in Switzerland and Austria.

Further the time spent in Heidelberg was useful to Sederholm also in other respects. By conversing with Americans there he improved his knowledge of the English language. Perhaps at that time the longing awoke in him to see the continent beyond the Ocean, and later on, when this longing became reality, he had certainly profited by his sojourn in Heidelberg in a double sense.

Soon after his return from Heidelberg, 1891, Johannes Sederholm disputed for the degree of Doctor of Science at the University of Helsinki. His dissertation was entitled: »Ueber archaische Eruptivgesteine im südwestlichen Finnland». In describing in this paper the uralite porphyrites of Tammela in Southwestern Finland he gave full evidence of really actualistical views by emphasizing that the old Archaean rocks in question had originally been melaphyres or basalts like the recent ones, and that they attained their present altered shape by metamorphism, having during long geological periods been buried low down in the deeper parts of the earth's crust and thus under high pressure and in high temperature been exposed to folding and other mountain building movements there.

More strongly still than in his dissertation Sederholm emphasized these actualistic or uniformitarian principles in two other publications of his, the one published in 1893 under the title »Om berggrunden i södra Finland» (On the Rockground in Southern Finland) and the other in 1895, entitled »Några ord om södra Finlands prequartära geologi» (Some words on the Pre-Quaternary Geology of Southern Finland). In the last named paper he expressed his opposition against the antiactualistic theories of his former teacher, Professor F. J. Wiik, who, though a prominent mineralogist, was a natural philosopher with a tendency to mysticism. The actualistic principles in geology Sederholm maintained and defended during his whole life of geological work. He completely succeeded, aided by his friend



Wilhelm Ramsay, in consolidating them in the opinions of the geologists of his own country.

After having passed trial as a Licentiate of Philosophy on March 4th, 1892, Johannes Sederholm was nominated Director of the Geological Commission in Finland, on February 1, 1893. In that very same year, he married Anna Ingeborg Mathilda von Christierson, who survives him. To this union were born three children who are still alive: two daughters, Margareta (Mrs. Zilliacus) and Wasthi, and one son, Karl Gustaf, who is at present the Physician of the factory of Karhula in South Finland.

Sederholm remained in his position as Director of the Geological Commission until the summer 1933, when, at the age of seventy, he was pensioned and retired. During this long time he was an excellent Chief of his office, and the Geological Commission was prospering and became gradually larger and of more significance as an institution. While he administrated his office, Sederholm carried on his great scientific work which was the chief aim of his life. No wonder that he always endeavoured to keep the Commission at the highest possible scientific standard, above all by the example of his own eminent spirit of scientific inquiry. The essentially scientific task of the Commission shaped the course of Sederholm's work in many respects.

The work of the Geological Commission under the directorship of Sederholm has often been reproached for being carried on in too much a scientific way at the expense of practical aims. This might perhaps be true to some extent, but it must be kept in mind that for all effective ore-prospecting and for a systematic investigation of technically useful rocks and minerals a thorough geological mapping of the country on a scientific basis is indispensable. We must also remember that Sederholm, even in the first period of his leadership, by no means neglected the practical views in making up the working schemes for his Commission. He occupied himself with the technical usefulness of rocks and minerals in his country and even published a number of papers on the subject. He also showed his interest in this matter by taking shares in several commercial undertakings in rockindustry.

Johannes Sederholm was a leader in a creative and reformative sense. He founded the two journals of the Commission, the »Bulletin de la Commission géologique de Finlande» and the »Geologisen toimikunnan geoteknillisia tiedonantoja — Geologiska kommissionens geotekniska meddelanden». He also reformed the survey mapping of Finland by changing the scale of the maps from 1 : 200 000 into

1 : 400 000, in order to shorten the time for mapping out the whole country and getting sooner a final geological synopsis of it, which otherwise would have lasted for ages. In order to lessen the probable drawbacks of the smaller scale and to obtain greater clearness and synopsis, he edited two separate maps of each section instead of the earlier single one, one of them showing the rockground and the other the distribution of the soils.

During the first decade of this century Johannes Sederholm gave the first impulse to ore prospecting undertaken by the Geological Commission, adding to its staff the Mining Engineer Otto Trüstedt, who had been one of the Directors of the Pitkäranta Ore Mines, which at that time had discontinued their work. By making Mr. Trüstedt member of his staff, Sederholm indirectly caused the discovery of the Outokumpu copperore fields, which discovery was made by Trüstedt in 1909. This success was due to Trüstedt's strict and skilful application of a purely scientific method in finding out the mother rock of a large boulder of copperore, accidentally found in a spot about 50 km from Outokumpu.

This discovery of the Outokumpu copperore field was an important event not only for the Geological Commission but for the whole country. It awakened an increasing interest in ore prospecting and raised the hope of discovering in Finland a greater abundance of ore slumbering in the lap of the earth. On account of this, Sederholm regarded himself entitled to improve his own knowledge and experience about ore prospecting. Thus, when, in 1913, he attended the International Geological Congress in Canada, he took the opportunity of visiting some of the most important orefields in North-America, among these the famous nickelore fields at Sudbury, in order to gain a further knowledge of the ore-supplies there and the methods used in prospecting and mining.

After the Liberty-War in Finland, 1918, the Geological Commission began to carry on ore prospecting with renewed and increased energy. The methods introduced and promoted by Trüstedt were then used in the prospecting works of the Commission. Among the results obtained may be mentioned the discovery of the occurrence of pyritic ore at Jalovaara in Southeastern Finland made by P. Eskola. By magnetometric measurements Sederholm also had a thorough investigation made of the ironore fields of Porkonen and Pahtavaara in Kittilä in Finnish Lappland known earlier.

The most remarkable ore discovery, however, made by the Commission in afterwar time was the statement of fairly large amounts of nickelore in the mountain range of Petsamon Tunturit. There

Mr. H. Törnqvist, who took part in the mapping work of the Commission, accidentally found, in 1921, tracks of the said ore. Since 1924, the Commission during a long series of years carried on prospecting on this ore field in Petsamo, until at last, in the mountain of Kaulatunturi, the amount and the quality of ore was found by diamond-drilling to be sufficient for mining in a small scale. The Finnish Government, interested in these matters, then encouraged Sederholm, who in 1933 happened to be in America, to make attempts to induce the great International Nickel Company of Canada to take an interest in this new occurrence of nickel ore. Sederholm's efforts succeeded so well, that the Nickel Company almost immediately sent its experts to Finland in order to make inquiries about the matter. The result was an agreement between the Finnish Government and the English-American Nickel Trust granting them a concession for prospecting and working the orefields. Unfortunately destiny did not permit Sederholm to live long enough to see the success the Geological Commission obtained, in the summer 1934, by its drillingwork in the Kaulatunturi, resulting in an unveiling of new large amounts of nickel ore, which at least doubled the quantity of probable ore yieldings.

As Chief of the Commission Johannes Sederholm was always broad- and liberalminded and, as a rule, was on good terms with the members of the Commission. He was ready to help when applied to and was always a good comrade of his fellow geologists. He liked to discuss with them geological questions, especially those concerning the relative ages of the Archaean granites or the Pre-Cambrian formations. In order to remove differences of opinion about these matters, he used to arrange joint excursions to different places of special geological interest which were objects for nonconformity of opinion. The questions of controversy could then be discussed on the very spot. These excursions, as a rule, were of great advantage to the participants, affording them an excellent chance of getting familiar with the geology of many places in their country by own sight and of enjoying at the same time the always instructive and interesting company of their Chief.

If one wishes in a few words to characterize the scientific work of Johannes Sederholm's life, one must say that Sederholm was an eminent pioneer in the exploration of the Archaean and the Pre-Cambrian. This work he began quite naturally by exploring the geology of his own country, of which, in the course of years, he acquired an unrivalled and thorough knowledge. He was the first man who on the ground of actualistic principles made up a scheme for a chronological classification of the geological formations of Finland,



beginning with the oldest Archaean and proceeding to the latest Pre-Cambrian formations. It may, however, be mentioned that in these endeavours he was supported by the research work of other Finnish geologists. In the chronological scheme of Sederholm's his classification of the granites in Finland into four great groups, according to their supposed ages, was an essential ingredient and in many respects a criterion for the classification of the different formations.

Johannes Sederholm did not, however, confine his explorations merely to his own country; he extended his research and comparative studies to the whole of Fennoscandia and still farther to more distant countries and other continents, wherever there were to be found Archaean or Pre-Cambrian formations. Among distant countries he above all turned his attention to North-America, where the American geologists had already to a great extent successfully explored the rockground and made up schemes for its classification into different formations. It was especially the district around the Lake Superior, to which Sederholm paid attention, because it seemed him to afford chances for correlations with the rockground in Finland. He was, however, always fully conscious of the fact that in such correlations difficulties and uncertainties increased in an exact proportion to the growing distance from the starting point.

In these explorations and comparative studies Johannes Sederholm laid great stress upon intimate personal collaborations between geologists from different countries, and for that account he often arranged international geological meetings and excursions in Finland, while he himself attended international geological convents and congresses in foreign countries. The first time he got the chance of gathering foreign geologists in Finland was in 1897, when the Seventh International Geological Congress assembled in St. Petersburg. On that occasion Sederholm, in collaboration with Wilhelm Ramsay, succeeded in arranging excursions for the congressists also in Finland. A great many congressists took part in these excursions which were highly successful under the guidance of the two above-named excellent Finnish geologists.

The last time Sederholm got the chance of arranging international excursions in Finland was in the summer 1931, when he at the same time took the initiative to found an International Union for the Exploration of the Pre-Cambrian. Geologists from sixteen nations assembled on that occasion in Finland. The Union got the official name »Réunion pour l'exploration du Pré-Cambrien et des vieilles chaînes de montagnes».



It is rather a matter of course that Johannes Sederholm, in extending his comparative studies outside of Finland, at first turned his attention to Sweden, the neighbouring country of Finland, with its rockground most like that of Finland. The excellent work the Swedish geologists had accomplished during a long time of exploration of the rockground of their country, facilitated in a considerable degree comparative studies, but, as was quite natural because of the different startingpoints and presumptions, their opinions did not always agree with Sederholm's views, especially concerning the ages of the different rockformations. Sederholm often visited Sweden in order to get acquainted with its geology through his own experience and, being especially interested in the granites there, he endeavoured to get the granites on both sides of the Bothnian Gulf correlated with each other and put into a joint chronological scheme. As late as at an age of sixtyfour, he undertook quite alone long excursions in Dalecarlia in order to find arguments in favour of his own opinion about the age of the granites and porphyries there. Often he made trips from Finland over to Stockholm, where he gave lectures at the meetings of the »Geologiska föreningen i Stockholm» about questions concerning the rockground in Fennoscandia, and he tried in all possible ways to bring about collaboration between the geologists of Finland and Sweden. Many of his publications were printed in the »Geologiska föreningens i Stockholm förhandlingar».

Next to Sweden it was especially Southeastern Canada and the adjacent parts of the United States that attracted Sederholm's attention in his researching work about the Archaean and Pre-Cambrian rockground. Thus he several times travelled to America. In 1913 he attended the Congress in Canada and went to America also in the years 1922, 1928 and 1933. During those journeys he had the opportunity of making friends among the American geologists, doing all he could to enlarge and deepen their knowledge of Fennoscandian geology as well as to widen his own knowledge of the North-American rockground. In 1928, Sederholm was invited by a number of American universities to give lectures about the geology of Fennoscandia. He accepted this invitation and stayed for more than a whole year in America, extending his travels to California, lecturing at different universities of the United States and Canada and profiting from his sojourn in these countries by undertaking geological excursions in different districts, also visiting the Grand Canyon of Arizona.

That Sederholm succeeded in his lectures in America, became obvious from the fact that he was once more, in 1933, invited to give lectures there. This time the invitation came from the American

Association of Sciences, and Sederholm lectured in many places, also at the World Exhibition in Chicago. He combined this lecturing trip with a visit to the International Geological Congress in Washington, where he represented Finland and took part in several excursions arranged during the congress.

In Finland there are two districts, which Johannes Sederholm in his geological researches took a special interest in and to which he returned ever and again. These two districts are the field of schists in the near environments of the town Tampere (Tammerfors) and the archipelago between Pellinge and the Åland Islands.

The Tampere district, which he called the Tammerfors field, has through his excellent investigations and descriptions become a classic district in a geological sense. The beautiful conglomerates, the often varved clayschists and the tuffitic rocks in this field make it an extremely fascinating spot for geological research affording plenty of chance for the study of rock metamorphism and the determination of the relative ages of the old formations.

Sederholm paid special attention to the varves of the clayschists of that district and he was the first who maintained the idea that these varves are to be explained as deposits of the varying seasons of the year and thus are to be compared to the varves of the glacial clays. In these schists he found on the eastern shore of the Lake Näsijärvi small bagshaped inclusions of coal substance, which he thought were probably the fossil remnants of one of the oldest animals or plants of the earth. He called this problematic fossil »corycium enigmaticum», which term he derived from the Old-Greek words *κορύκιον* = bag and *αίνιγμα* = riddle.

It may be mentioned here that Johannes Sederholm enriched the nomenclature of petrography and geology very considerably by terms invented by himself. Herein he succeeded exceedingly well thanks to his ability in finding out the most essential and characteristic of everything he wanted to name and thanks to his knowledge of the classic languages, the words of which he used in a correct way for this nomenclature. The terms invented by him, as a rule, very soon gained general application in the petrographic or geologic literature.

The other one of Sederholm's favorite districts was the South-Finnish archipelago. In a still higher degree than the Tammerfors field it afforded possibilities for studying the mysteries of rockmetamorphism. The distinctly conspicuous metamorphism which the old rocks exhibited here Sederholm called »ultrametamorphism». Here he indeed found an eldorado for the study of the rocks intermingled with granite, the *migmatites*, as he called them, among which he dis-



tinguished quite a series of different species, inventing for each of them new names such as *arterites*, *agmatites*, *nebulites*, *stictolites*, *pygmatites*, *polymigmatites* etc. Here he got the impulse that led to his theories of *anateris*, that is the complete refusion of older rocks in the granitic magma, and of *palingenesis*, which meant the renewed eruption of the rocks, thus refounded, in the shape of a mixed magma. Still another term invented by him in connection with the migmatites was the name *ichor*, intended to cover nonpneumatholytic exsudations of a very diluted magma, emanating from eruptive bodies of different, but preferably granitic composition (granitic »juices»), and intimately penetrating adjacent gneissic schists.

To his two favorite districts Sederholm specially liked to take foreign geologists, particularly on congress excursions. Then the Tammerfors field became in one or the other regard the subject of controversy among the geologists, especially regarding the age of some of the rocks of it. One or the other Finnish geologist also professed opinions in their papers diverging from Sederholm's about the age of the granites or diorites in the district. Thus it happened that Sederholm had to enter into discussions both verbally and in the papers which he published on the subject.

Among other rock districts researched and described by Sederholm may be named the rapakivi massivs in South-Finland. Concerning the origin of the peculiar and very characteristic texture of the rapakivi rocks he somewhat changed his opinion in the course of years and finally became convinced of their close genetic relations to the orbicular granites. He expressed his latest opinion about this topic in a paper under the title »On Orbicular Granites, Spotted and Nodular Granites etc. and on the Rapakivi Texture». In this paper he describes the numerous orbicular granites found in Finland and he finally tries to explain their rather uncommun texture, and that of the rapakivi rocks, suggesting that both kinds of rocks may have been generated through an exceptionally viscous magma, which he supposed to have caused an internal friction, preventing any diffusion, and gradually causing the cessation of the crystallization of the potash feldspar and the formation of spheroidal crystals instead of those with a perfect crystal form.

Among the most comprehensive petrographical publications of Sederholm may be named the one entitled »On Synantetic Minerals and Related Phenomena», issued in 1916. The term »synantetic» was invented by Sederholm himself; it means the minerals which in some eruptive rocks have generated by the reciprocal reaction of two or more neighbouring minerals, at an earlier time solidified from

the cooling magma. In this paper Sederholm compiles the most important instances found in the petrographic literature concerning minerals originated in this way, and he finishes his compilation by quoting his own observations on the subject.

Johannes Sederholm has published an imposing number of most valuable papers concerning the different branches of geology. It would lead us to far into details, if we were to enter into further particulars about them. We are therefor obliged to restrict ourselves to merely mentioning a few characteristic ones among them. Thus we mention papers dealing with topics of Quaternary geology, such as the highest limits of the Yoldia-sea or the geological origin of the soils in Finland. Other papers deal with tectonical questions, as for instance the faults in Fennoscandia or the configuration of the ground of the Lake Päijänne. Also pure geographical topics are commented on in some of his publications, especially in the descriptions Sederholm contributed to the »Atlas of Finland», edited by the Geographical Society of Finland. In a paper called »The Average Composition of the Earth's Crust in Finland» he does not only calculate the average of all available rock analyses of Finland, but also takes into consideration the relative areas of the extension of the rocks in question, in order to get the right proportions in calculating the average.

It may, however, be mentioned that there was one comparatively actual and important geological question that Sederholm never dealt with in any of his printed papers. This was the hypothesis on the drift of the continents, forwarded by A. Wegener, a hypothesis which caused long discussions among the geologists of almost all countries. Yet, Sederholm discussed the matter on several occasions with his geologist friends and then always emphasized a strictly negative standpoint towards the hypothesis. Among the manuscripts he left, there is a fragmentary one, in which he explains all his reasons against Wegener's hypothesis about the floating continents. Let us here only set down his final judgement on the subject, which may be translated into English as follows: »The theory of Wegener is from its beginning a pure fancy inspired by the contemplation of maps. It is not founded upon any geological facts and does not take consideration into them. The idea that the continents were to a great extent in the Quaternary time floating about at the speed of an expresstrain, reduces this hypothesis to absurdity. The hypothesis is extremely antiactualistic, if not directly cataclysmatic. The author appears to suppose that the ocean consists of melted sima, although even the adherents of the hypothesis, as for instance Staub, presume that the ground of the oceans is more stabile and strong than that



of the continents. As Staub admits, the theory does not at all declare the movements. After all explanations about the matter one is just as wise as the peasant, to whom all the details of an engine had been explained and who at last exclaimed: I fully understand everything except where the horses are hidden.»

In spite of the multitude of different geological questions which Johannes Sederholm was occupied with, the old Archaean rocks, the magmatic phenomena of the granites and the Pre-Cambrian questions always remained the main objects of his interest. Therefor the number of his publications dealing with these questions is very considerable. They are partly written in a more or less polemical fashion, for the opinions set forward by Sederholm, especially concerning the classification of the rockground in Fennoscandia, were not always accepted by his fellow geologists and he had thus often to meet with opposed views and to discuss them. While in many cases he succeeded in defending and maintaining his opinions, he, nevertheless, was always ready to yield his point and give away where he thought it necessary. Thus he did not hesitate to admit the incompleteness of his old methods of determining the relative ages of rocks, when new stratigraphic methods, based on exact tectonic analyses, were invented. When these new methods were introduced to Finland by the young Swiss geologist Eugen Wegmann, Sederholm, who at that time was over sixty years old, became an enthusiastic advocate for these methods and in all possible ways helped Wegmann in his endeavours.

The first Wegmann attended to in his explorations in Finland was the study of the range of old folded schists in Carelia. This range of schists, which from Southeastern Finland extends northwards up to Lapland, is called by him in his publications the Lappo-Carelides and is believed to be remnants of an old Pre-Cambrian mountain range. Wegmann proved the tectonics of this range to be much the same as those of the youngest mountain-buildings, especially those of the Alps. Also in these Pre-Cambrian formations of Carelia there appear districts of greater resistance alternating with such of tectonically strongly moved rockbodies with foldings and overthrusts, quite in the same way as in the latest mountain ridges. This statement meant an affirmation of the actualistic views always supported by Sederholm. At the same time it rendered full evidence of the correctness of the opinion, for a long time maintained by Sederholm, that no ubiquity of mountain building and folding processes can be supposed to have taken place in Archaean and Pre-Cambrian times, as had been universally presumed earlier, but that also in those old geological periods mountain building was, like now-

days, a phenomenon restricted to comparatively narrow zones of the earth's crust. When Sederholm set forth this theory in his publications he did it in the conviction, that it was, as he said himself, his most original contribution to science; he had the satisfaction in knowing that no other geologist before him had suggested this theory.

In regard to geological work, Johannes Sederholm laid the principal stress upon observations in the field, which he considered to be more valuable to the elucidation of rock mysteries than all laboratory- and other indoor work. He therefor considered it of the greatest importance for a geologist to travel about in the world as much as possible, in order to obtain the possibly largest experience in geological matters by seeing things with his own eyes. Scarcely has any of his fellow geologists travelled as much as Sederholm did during his life. He materially improved his geological experience not only by attending a great number of international geological congresses in different countries, but also by undertaking geological excursions and travels at many other occasions. Thus he visited most of the countries of Europe, including Russia, where he undertook excursions to the Kola Peninsula, The Wolga river, Caucasia and the Crimea. As we have already said, he visited America several times. He also twice went to Central Asia, the first time in 1916, when he attended an expedition for gold prospecting to the Kolbinsk mountains, and the second time in 1917, when he was the leader of a practical-geological expedition to Uriankhai in Outer Mongolia.

Sederholm not only sacrificed most of his lifetime and his best powers to his own science, but he devoted himself also to a great many other branches of human culture, so he can be said to have been an exceptionally many-sided personality and, as his friend Professor Westermarck remarked, »nothing human was strange to him.»

He always had a great interest in politics. It was above all the politics of his own country to which he turned his attention and he showed his patriotic mind on many occasions. When at the end of the last century and in the beginning of 1900 the Russian Government tried to destroy the Home Rule of Finland and to Russianize the country, Sederholm was a decided partisan of the passive resistance, by which the best elements of the Finnish people tried to thwart the Russian violence. During his sojourns abroad he made his best in spreading the knowledge about this passive resistance and the righteous cause of Finland. When, in 1905, the first Russian revolution broke out and influenced the development of the internal politics of Finland, Sederholm was 1905—1906 a Member of the Finnish

Parliament. Clearly conceiving the great danger that threatened his country from too fargoing democracy and from the marxistic propaganda carried on among the labourers, he spared no trouble to inform them, by giving lectures in the labour-unions, chiefly those in Helsinki, in order to maintain their respects for the ideals of the civil state.

In the years 1920 and 1921 the Finnish Government claimed his services concerning the Åland Islands. We remember that in those years Sweden raised objections against Finland's legitimate ownership of these islands. Sederholm was made one of the delegates who represented Finland in the international committee, which gathered in Paris in order to discuss this question. After the meetings in Paris, Sederholm had to go to Washington for the same purpose, summoned there by the Finnish Minister in Paris. In Washington he did all he could to forward the cause of Finland. By the efforts Sederholm made on these occasions in favour of his country, and especially by a very skilfully written paper, entitled »The Åland Question», by which he showed Finland's indisputable right to the ownership of the Åland Islands, he rendered valuable service to his own country and materially contributed to the solution of the Åland question in favour of Finland.

At the end of the year 1921, Johannes Sederholm was once more entrusted with a political mission. This time it was the League of Nations that appointed him a member of a commission of three, which had to make researches about the critical situation in Albania. By the Great Powers of Europe Albania had at the treaty in London, in 1913, been made a sovereign state, and was now menaced by rivaling Balkan states and by Italy. In 1921 Jugoslavian troupes had invaded Albania and occupied great parts of the country; at the same time riots had broken out in the northern districts. The League of Nations therefor threatened to blockade Jugoslavia, unless it evacuated the country at a fixed time. The above mentioned commission was charged at first to inform the League of Nations, whether the evacuation was duly performed, and secondly to find out ways for prohibiting all further interference from foreign Powers in the affairs of Albania.

The Commission had no difficulty regarding the Jugoslavians, who, following the order of the League of Nations, promptly retired with their forces from Albania on the fixed day. We are, however, told that this prompt evacuation was to a great extent due to the fearless resolution of Sederholm, who without any military escort, followed only by his secretary and servants, rode out to meet the



Commander of the Servians in order to settle matters in a peaceful way and succeeded in convincing the Commander. The Servians submitted themselves to the authority of the League of Nations surprised and overpowered by the fearlessness of Sederholm.

The problem of finding out means for a really effective protection of Albania's integrity was not so easily solved. It required a thorough recovery of the interior relations and above all of the economics in order to enable the population to consolidate themselves and to stand firm against all attacks from outside. For that purpose the members of the Commission to begin with had to make themselves familiar with the interior relations of the country and the peculiarities of its population. Soon after the arrival in the metropolis Tirana, the Commission had a narrow escape from a threatening danger. Insurgents from the mountain districts together with nationalists from Central Albania were in a fair way of invading Tirana and they would have done so, had it not been for their deficient organisation and the intervention of the British Minister, who proved to have a mighty influence upon them. Shortly after this event, two members of the Commission were compelled to leave Albania for private reasons, and Sederholm was left alone with his secretary to accomplish the mission. He then remained for more than a year in Albania working for the League and for the country. Sederholm became very popular among the Albanians, and during the time of his sojourn in Albania he improved his knowledge about the country and its people, and he left Albania, in April 1923, with a favourable impression of its strong and intelligent population, whose qualities he believed would guarantee development towards further civilisation and at the same time, in view of the sufficient natural resources of the country, towards economic recovery.

Besides politics Sederholm was greatly interested in economic and social questions. As a member of the Economic Society in Finland he gave at the meetings of this society several lectures, among these, in 1904, one dealing with the reasons for North-American industrial supremacy. He also took interest in Scientific Management set up by the American F. W. Taylor, who framed the idea that all human as well as all factory work ought to be regulated in a scientific way, in order to yield the greatest possible efficiency and the best possible economic results with the smallest loss of time and a limited consumption of energy. About this system by Taylor, the systematic organisation of work, Sederholm wrote a comprehensive, excellent paper called »Arbetets vetenskap» (The Science of Work).



Johannes Sederholm was greatly interested in foreign languages and possessed a great aptitude in learning them. This was an eminent advantage in his many journeys in foreign countries, and he profited greatly by this aptitude in reading not only professional literature, but also fiction in foreign languages just as easily as in his own mother-tongue. He thus constantly enlarged and improved his own literary education. But he also endeavoured to spread, as much as he could, education among his compatriotes by lecturing in labour institutes and before other audiences. On these occasions he preferred to speak on geological topics or he gave descriptions of the countries and the peoples he had become acquainted with on his journeys. Sederholm was an excellent speaker, and while he wrote in an elegant and lively style, he was also a prominent lecturer. When he had to make speeches at banquets, he liked to spice these speeches with witty remarks.

Johannes Sederholm was a member of a great many scientific societies both in his own country and abroad. Since 1904, he was a member of the »Finska Vetenskaps societeten» (The Finnish Society of Science). The Geographical Society of Finland, where he had been a member from the very beginning, made him, in 1933, an Honorary Member. Sederholm was extremely interested of all geographical work done in Finland and he can be said to have been one of the most prominent supporters of the said society. Five times he acted as chairman and he was a member of a great number of its committees as well as he represented it several times at international geographical and geological congresses. Many times he lectured in this society on geological and geographical topics and made valuable contributions to its periodicals and to the three editions of the »Atlas of Finland», which was one of the most remarkable publications of the society. Of many foreign societies he was either a Corresponding or an Honorary Member. The Geological Society in London conferred upon him the Murchisson Medal and the Geological Society of America honoured him with the Penrose Gold Medal. The Universities of Kristiania (Oslo) and Upsala made him an Honorary Doctor and at the Universities of Toronto and Kingstone he was solemnly promoted to the degree of Doctor of Law.

In honour of the sixtyfifeth anniversary of his birthday a publication was offered to him by 42 geologists, among whom there were several prominent European and American scientists, all of them contributing their dissertations. The prefatory note was written in cordial words by his old teacher W. C. Brögger.

All this homage obviously displayed, how highly appreciated were Sederholm's personality and his scientific work. It seems especially have been the case in America, and the said country seems perhaps more than any other to have had a fascinating attraction for Sederholm. It was there that he went on his last great journey, in the summer 1933, at an age of seventy. During this journey he did not spare his strength, pursuing his aim of lecturing and making excursions, and perhaps he then overstrained himself, as he was no longer the same strong man as in younger days. Finally when, in the autumn 1933, he returned home, he continued with energy to complete his still unfinished geological work, but gradually it became obvious that his health had given way and at last he was not strong enough to overcome the fatal disease which, in the summer 1934, ended his life, while he was still in possession of mental energy and ardent desire for scientific work.

Johannes Sederholm shall long be remembered far and wide not only as an eminent, far-famed geologist, but also as a highly cultivated, polymathic personality with uncommonly extensive knowledge and interests. And he shall survive in the memory of a more intimate circle of relatives and friends as a kindhearted and sensitive character with a superior intelligence and eminent culture.

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N:o 1.	Cancrinitsyenit und einige verwandte Gesteine aus Kuolajärvi, von WILHELM RAMSAY und E. T. NYHOLM. Mit 4 Figuren im Text. Mai 1896	15: —
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N:o 5.	Bidrag till kännedom om Södra Finlands kvartära nivåförändringar, af HUGO BERGHELL. Med 1 karta, 1 plansch och 16 figurer i texten. Deutsches Referat: Beiträge zur Kenntnis der quartären Niveauschwankungen Süd-Finnlands. Mai 1896	30: —
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* N:o 12.	Der Meteorit von Bjurböle bei Borgå, von WILHELM RAMSAY und L. H. BORGSTRÖM. Mit 20 Figuren im Text. März 1902	20: —
* N:o 13.	Bergbyggnaden i sydöstra Finland, af BENJ. FROSTERUS. Med 1 färgglagd karta, 9 taflo och 18 figurer i texten. Deutsches Referat: Der Gesteinsaufbau des südöstlichen Finnland. Juli 1902	70: —
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N:o 23.	Om granit och gneis, deras uppkomst, uppträdande och utbredning inom urberget i Fennoskandia, af J. J. SEDERHOLM. Med 8 taflor, en planteckning, en geologisk öfversiktskarta öfver Fennoskandia och 11 figurer i texten. English Summary of the Contents: On Granite and Gneiss, their Origin, Relations and Occurrence' in the Pre-Cambrian Complex of Fenno-Scandia. With 8 plates, a coloured plan a geological sketch-map of Fenno-Scandia and 11 figures. Juli 1907	50: —
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N:o 74.	Die Kalksteinlagerstätten von Ruskeala in Ostfinnland, von ADOLF A. TH. METZGER. Mit 9 Abbildungen und 2 Karten im Text. Aug. 1925	20: —
N:o 75.	Ueber die kambrischen Sedimente der karelischen Landenge, von BENJ. FROSTERUS. Mit 1 Figur und 9 Tabellen im Text. Sept. 1925	30: —
N:o 76.	Über die prequartäre Geologie des Petsamo-Gebietes am Eismeere, von H. HAUSEN. Mit einer geologischen Übersichtskarte und 13 Figuren im Text sowie 2 Tafeln mit 12 Mikrophotographien. Juni 1926	30: —
N:o 77.	On Migmatites and Associated Pre-Cambrian Rocks of Southwestern Finland. Part II. The Region around the Baröunds fjärd W. of Helsingfors and Neighbouring Areas, by J. J. SEDERHOLM. With one map, 57 figures in the text and 44 figures on IX plates. Dec. 1926	60: —
N:o 78.	Geologische und petrographische Untersuchungen im Kainuugebiet, von HEIKKI VÄYRYNEN. Mit 37 Figuren im Text, 12 Figuren auf 2 Tafeln und 2 Karten. Februari 1928	40: —
N:o 79.	Studien über den Gesteinsaufbau der Kittilä-Lappmark, von VICTOR HACKMAN. Mit 2 Tafeln, 2 Karten und 23 Figuren im Text. Dec. 1927	40: —
N:o 80.	Über die spätglazialen Niveauverschiebungen im Nordkarelien Finnland, von MATTI SAURAMO. Mit 8 Figuren im Text; 11 Figuren, 1 Karte und Profildia-gramm auf 7 Tafeln. Juni 1928	15: —
N:o 81.	On the Development of Lake Höytiäinen in Carelia and its Ancient Flora, by MATTI SAURAMO and VÄINÖ AUER. With 20 figures in the text and 4 plates. March 1928	14: —
N:o 82.	Über Wiikit, von LAURI LOKKA. Mit 12 Abbildungen und 21 Tabellen im Text. März 1928	30: —
N:o 83.	On Orbicular Granites, Spotted and Nodular Granites etc. and on the Rapakivi Texture, by J. J. SEDERHOLM. With 19 figures in the text and 50 figures on 16 plates. September 1928	50: —
N:o 84.	Über das Verhältnis der Ose zum höchsten Strand, von MATTI SAURAMO. Mai 1928	10: —
N:o 85.	Suomen Geologisen Seuran julkaisuja — Meddelanden från Geologiska Sällskapet i Finland — Comptes rendus de la Société géologique de Finlande, 1. Avec 1 stéréogramme. Février 1929	40: —
N:o 86.	The Quaternary Geology of Finland, by MATTI SAURAMO. With 39 figures in the text, 42 figures on 25 plates and 1 map. January 1929	60: —
N:o 87.	Suomen Geologisen Seuran julkaisuja — Meddelanden från Geologiska Sällskapet i Finland — Comptes Rendus de la Société géologique de Finlande, 2. Avec 48 figures dans le texte et 6 planches. Juin 1929	70: —
N:o 88.	Studier över kvartärsystemet i Fennoskandias nordliga delar. IV. Om nivåförändringarna och grundragen av den geografiska utvecklingen efter istiden i Ishavsfinland samt om homotaxin av Fennoskandias marina avlagringar, av V. TANNER. Med 84 figurer i texten och 4 tavlör. Résumé en français. September 1930	150: —
N:o 89.	Beiträge zur Kenntnis der Svecofenniden in Finnland. I. Übersicht über die Geologie des Felsgrundes im Küstengebiet zwischen Helsingfors und Onas, von C. E. WEGMANN. II. Petrologische Übersicht des Küstengebietes E von Helsingfors, von E. H. KRANCK. Mit 32 Fig. auf 16 Taf., 4 Textfiguren und einer Übersichtskarte im Masstabe 1:75 000. Juni 1931	40: —
N:o 90.	Geologie des Soanlahtigebietes im südlichen Karelien. Ein Beitrag zur Kenntnis der Stratigraphie und tektonischen Verhältnisse der Jatulformation, von H. HAUSEN. Mit 23 Figuren im Text, 12 Figuren auf 4 Tafeln und einer geologischen Übersichtskarte im Masstab 1:80 000. April 1930	50: —
N:o 91.	Pre-Quaternary rocks of Finland. Explanatory notes to accompany a general geological map of Finland, by J. J. SEDERHOLM. With a map and 40 figures in the text. August 1930	30: —



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N:o 102.	Compte rendu de la Réunion internationale pour l'étude du Précambrien et des vieilles chaînes de montagnes, rédigé par C. E. WEGMANN et E. H. KRANCK, publié par J. J. SEDERHOLM. Mai 1933 .....	30:—
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N:o 112.	JAKOB JOHANNES SEDERHOLM. Biographic Notes and Bibliography, by VICTOR HACKMAN. With a vignette. October 1935 .....	20:—





