

The International Polar Year History in Finland

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The first International Polar Year

In August of 1879 an open letter from the International Meteorological Commission arrived at the Finnish Society of Sciences and Letters (founded in 1838) inviting all members of the scientific community to a conference to take place in October in Hamburg to discuss the proposals of Austrian lieutenant Karl Weyprecht (1838-1881) to establish numerous observatories in the Arctic and Antarctic regions. Weyprecht had studied the aurora and geomagnetism in the polar regions and had published a guidebook on these phenomena.

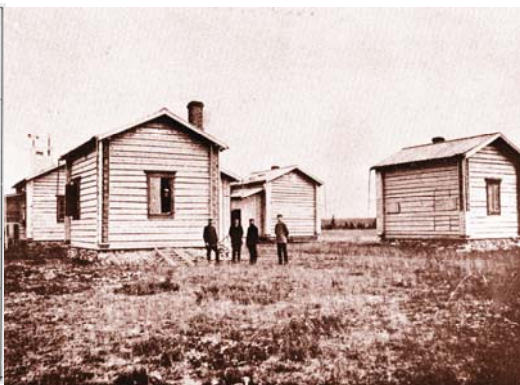
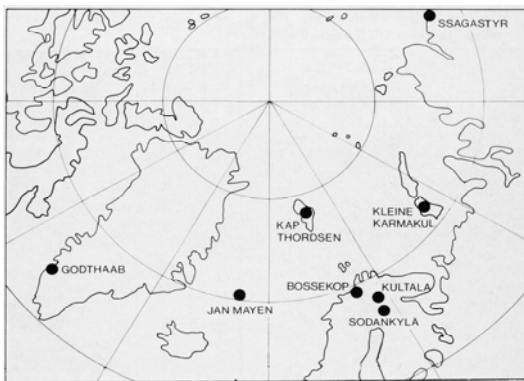


Left: Karl Weyprecht (1838-1881) initiator of the Polar Year. Died before the Year started. (Source: Finnish Meteorological Institute)

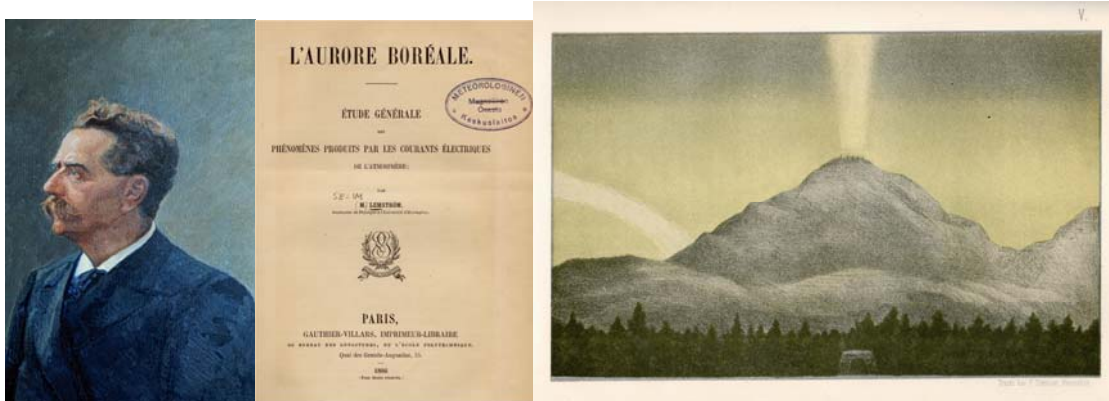
Bottom left: The sites of observatories during the Polar Year. (Source: Simojoki, 1978)

Bottom right: Observatory buildings in Sodankylä during the Polar Year. (Foto: Lemström and Biese, 1887)

The meteorological conference established the International Polar Year, to be organised by the International Polar Commission. The observatories to be established were to make simultaneous, closely spaced measurements, once per hour. The Commission recommended that observatories be established at Spitsbergen, Novaja Zemlja, Finnmark, the mouth of the Lena River in Northern Siberia, the New Siberian Islands, Point Barrow (on the shore of the Bering Strait), and on Greenland's east and west coasts. In the Southern Hemisphere stations were to be established at Cape Horn, either the Kerguelen Islands or Macdonald Island, and the Auckland Islands.



The practical implementation of the Finnish participation in the First Polar Year was given to Professor Selim Lemström (1838-1904), who was the first modern physics professor in Finland. He was appointed in 1878. Prior to that he had participated in the Swedish polar expedition to Spitsbergen in 1868. At that time the aurora borealis was the subject of intensive research, which, among other things, demonstrated the correlation between the aurora and geomagnetism. This connection became Lemström's principle research activity, along with earth currents. He believed that all these phenomena were closely connected to one another.



Selim Lemström (1838-1904) and his book about auroras. (University of Helsinki)

Thanks to Selim Lemström's efforts the Finnish Society of Sciences and Letters participated in the Polar Year, and the station originally intended for Finnmark was replaced by stations at Sodankylä and Kultala. With the help of the Finnish Society of Sciences and the St. Petersburg Academy of Sciences he was able to obtain financial support for these stations from the Finnish Senate in the amount of 48 330 marks (~165 000 € in modern currency). As an international event the Polar Year was close to the Russian Tsar's heart. Tsar Alexander III (1845-1894), who had just one year earlier ascended to the throne on the assassination of his father, longed for fresh contacts abroad. The Tsar was relieved that his Finnish Senate showed such enthusiasm for the project. At the same time the Senate was able to bring attention to itself, namely by publishing Professor Lemström's Polar Year Report in French and Swedish for international distribution.

On the one hand Selim Lemström was criticised for his aurora research, while on the other hand he received a medal for it at the Paris World Exposition in 1889. Lemström published in 1886 a book on the aurora, in which he presented the most important explanations, including some of his own views that were later shown to be erroneous. Nonetheless, he did not continue his aurora studies, but rather turned to the effects of earth currents on the growth of grain crops. Earth currents had been his original favourite subject, and from there came his interest in auroras, which explained his experimental arrangements in Lapland during the Polar Year.

From the point of view of the history of space research it is important that Selim Lemström's interests included the aurora. For Finland, participation in the Polar Year 1882-83 was of key significance. It connected Finland once again to the development of

international geophysics and, in particular, to international aurora research. Moreover, by itself it prepared Finland for participation in the Second Polar Year in 1932-33.

The Second Polar Year

The Central Meteorological Institute's Director, Gustaf Melander took part in the decision to organise the Second International Polar Year, 1932-3. The decision was made at a conference of directors of international meteorological institutes in Copenhagen in September 1928. Responsibility for organising the event was given to a special commission, the "Commission internationale de l'année polaire 1932-1933". The Danish geophysicist Dan Barfod la Cour (1867-1942) was chosen to be the chairman of the organising commission. Melander's assistant Jaakko Keränen was appointed Finnish member of the commission, and also was given the responsibility of organising Finland's participation in the Polar Year.



Left: Sidney Chapman, Jaakko Keränen, Dan La Cour and Lise La Cour photographed against a painting at the market place in Rovaniemi in 1936.

Bottom: Annikki and Eyvind Sucksdorff preparing instruments for auroral observations at Sodankylä Geophysical observatory in 1932.

(All fotos: Finnish Meteorological Institute)

At the time of the Second Polar Year the world had fallen into the Great Depression, which interfered with the hoped-for participation of many. In support of a proposal to postpone the Polar Year it was noted that the period from the beginning of August 1932 to the end of August 1933 was a minimum in the 11-year Solar Cycle, not a particularly interesting period from the standpoint of solar-terrestrial research. Nonetheless the preparation committee's chairman la Cour was a resolute man. In February 1932 the American Rockefeller Foundation gave 40 000 \$ for magnetic instruments and radiosondes for use during the Polar Year. This grant enabled the participation of many countries that otherwise would have not been able to do so.



In Finland participation in international projects was enthusiastic, relatively undampened by the Depression, because the representatives were usually government officials, sometimes accompanied by assistants. The Sodankylä Observatory had a central position in the planners' eyes. Manned stations were established at Petsamo and Kajaani for magnetic field measurements. Geophysical research in Finland was well integrated into the international science community, which helped preparations. Unlike during the first Polar Year, Sodankylä was easily accessible: an overnight train to Rovaniemi, and from there by bus to the Observatory in Sodankylä. Geophysicists from many countries came to the Sodankylä Observatory during the Polar Year, bringing their own instruments and making their own observations.



The main building of Sodankylä Geophysical Observatory in 1944 and the ruins in 1945 after the war. (Foto: Finnish Meteorological Institute)

Finnish geophysics benefited from the strengthening of international contacts and the data gathered were significant. But no especially important scientific problem appeared to be solved. Geomagnetic measurements offered no new challenges, nor did there seem much new to be said about aurora. In addition to the problems caused by the Depression and the Solar Minimum, the world found itself at war before the gathered data could even be examined. Much of the data were lost, for example, in the destruction of the Sodankylä Observatory in the fall of 1944, as well as in similar incidents elsewhere. A special "Second Polar Year Clarification Committee" operated in Copenhagen in the years 1946-50, organising the preserved data.

The Third International Polar Year (International Geophysical Year)

In 1950 the Englishman Sidney Chapman and the American Lloyd Berkner presented their ideas at the new Polar Year in Brussels to the "Mixed Commission on the Ionosphere", which the ICSU had formed to make plans for a Polar Year. The Commission was made up of representatives from the URSI (Union Radio Science International), the IAU (International Astronomical Union) and the IUGG (International Union of Geodesy and Geophysics).

The ICSU adopted the idea and at its meeting in Washington in the spring of 1951 and established a special committee to promote the plan. At this stage the project's name was

the “Third Polar Year”. In May 1952 the ICSU Office sent invitations to its members and the Science Academy of the Soviet Union to participate in the Third Polar Year. The invitation came also to the Finnish Academy of Science and Letters, which forwarded it to Prof Jaakko Keränen.



Professor Jaakko Keränen (1883-1979) in Inari in 1959 (Foto: Finnish Meteorological Institute)

Right from the beginning the Third Polar Year was in a much better position than its predecessor. A Solar maximum was expected in 1957-8, economically the United States and Western Europe were booming, and soon artificial satellites would open completely new windows to space. In addition, development of radio techniques continued after the war. At the ICSU General Assembly meeting in Amsterdam in 1952, the Third Polar Year was named the “International Geophysical Year”, or IGY. At the same meeting the ICSU appointed a special committee (Comité Spécial de l’Année Géophysique Internationale, CSAGI) to lead the preparation and then its execution. Sidney Chapman became President of the committee, Lloyd Berkner Vice-President, and Belgian Marcel Nicolet Secretary-General.

The IGY was extraordinarily important to Finnish geophysics research and Finland played an important role in its demanding organisation. The National Geodetic-Geophysical Committee of Finland presented a report on its activities to the international union in April 1954. In that report Secretary Eyvind Sucsdorff told of the establishment of a geomagnetic observatory in 1952 at Nurmijärvi by the Geomagnetic Department of the Meteorological Central Institute and the prospects for an earth-current observation station in Sodankylä before the beginning of the IGY. In addition, Finland sent a large delegation to the IGY planning meeting organised in Rome in September 1954.



(Left) ASC tower in Sodankylä. (Mid) S. Chapman (standing) visits Sodankylä during IGY. (Right) New observatory building at Nurmijärvi. (Finnish Meteorological Institute)

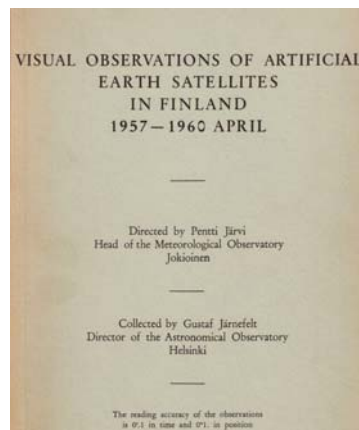
The National Geodetic-Geophysical Committee of Finland and the National Radio-Science Committee of Finland formed an executive committee in 1955 to take care Finland’s participation in the IGY. Jaakko Keränen served as chairman and Lauri A. Vuorela as secretary.

Including preparatory work, the costs for IGY during the period 1956-8 were estimated to mount to 21 750 000 [Finnish] marks (446 717 €), paid by the Ministry of Education. In addition, unemployment relief funds, amounting to some 4 300 000 marks (80 941 €), were used at the Sodankylä Geophysical Observatory in 1957 for the Ionosphere Station, which was established expressly for the IGY. Moreover, the German Max Planck Institute für Aeronomie brought several important instruments to Sodankylä, as well as a technician for maintaining them

The Nurmijärvi geomagnetic observatory was equipped by the ionospheric sounding station designed by the Radio Laboratory of Finland's Technical Research Centre.

An earth current observation station was established at the Sodankylä Geophysical Observatory. In addition, due to the efforts of Walter Dieminger, Director of the Max Planck Institut für Aeronomie, oblique ionospheric sounder was operated at Sodankylä in coordination with the "Jonathan Zenneck" research station in Tsumeb in South-West Africa (later Namibia). Dieminger served as director of the African station during the IGY.

Finland joined the international aurora camera network by starting aurora borealis photography at Sodankylä and Ivalo,. In addition international research groups came to Finland and Lapland to carry out observations, often with equipment brought with them. Personal acquaintance with foreign colleagues was valuable, often fostering cooperative efforts. Sidney Chapman, too, visited Finland during the IGY.



Observations at the Meteorological Observatory JOKIOINEN
 $\varphi = 60^{\circ}48'50''$, $\lambda = 23^{\circ}30'9''$, altitude above the Sea
 (103 meters):

Date	Time ^{a)}	Azimuth ^{b)} observed	Height ^{c)} observed
13.10.1957	4.11.	296	24
	4.15	298	12
	5.48.00 ^{X)}	52.0	24.79
	5.48.18	41.0	24.71
13.10.1957	5.48.53	24.0	22.42
	5.49.18	15.5	20.53
	4.04.50	311.	11.8
15.10.1957	4.05.10	disappeared	
	5.39.16	appeared	
15.10.1957	5.39.24	56.0	17.61
	5.39.39	51.2	17.77
	5.39.54	46.4	17.63
	5.40.09	40.1	17.28
	5.40.24	34.9	16.71
	5.40.39	30.2	15.97
	5.40.54	26.0	15.26
	5.41.09	21.2	14.00
	5.41.24	17.4	13.18
	5.41.39	14.1	12.29
	5.41.54	11.1	11.23
	5.42.09	8.5	10.26
	5.42.24	6.1	9.26
5.42.36	4.2	8.51	
16.10.1957	4.07.	303.	25.
16.10.1957	5.48.	48.	8.
	5.49.10	40.	3.

The reading accuracy of the observations
 is 0.1 in time and 0.1 in position

Gustaf Järnefelt (1901-1989) (Foto: University of Helsinki) and the publication of first satellite observations. (Finnish Meteorological Institute)

An essential part of Finland's participation in the IGY were the satellite observations of the University of Helsinki's astronomy professor, Gustaf Järnefelt, which began on 13 October 1957 only nine days after the launch of Sputnik 1. Theodolites made for observing weather balloons were at first used in Helsinki, but soon observations were moved to the observatory at Jokioinen, under the direction of M.Sci. Pentti Järvi. Visual observations enabled very accurate measurements of the satellite's orbit, from which properties of the Earth's atmosphere, the Earth's shape, and the structure of the Earth's gravity field could be calculated.

Professor Järnefelt's original measurements inspired more promise and expectations than were later remembered. Inspiration for satellite observation came from the IGY plan. In

his preface to his first publication of the measurements Järnefelt mentioned that they were part of an international chain. The observations were based on information arriving daily from the Soviet Union, the United States, and the United Kingdom.

During the IGY numerous satellites were orbiting the Earth. By April 1959 some 15 satellites had been observed at Jokioinen, as well as their launch vehicles in their final stages. The Jokioinen observation station distributed its results daily to a network of foreign stations. Dissemination took place in the form of air mail, teleprinter, and telegram and originated at first from the Helsinki Observatory, but from May 1958 data were distributed by the communications centre of the Finnish Meteorological Institute.

Finland's government and other official quarters showed surprising enthusiasm for the observations. The Finnish Broadcasting Company (YLE) donated 75 000 FIM (1 414 €) to help start operation. In the beginning of 1958 the Finnish government appropriated 2.3 million FIM (43 367 €) for the satellite observation operation, while already in 1957 the University of Helsinki had earmarked 550 000 FIM (10 370 €) toward the purchase of an automated theodolite. Money was also needed to hire observers. Fortunately, as Järnefelt had foreseen, there were already sufficient trained personnel at the Jokioinen meteorological observatory. These people had already been following balloons, even at night, the same sort of process was needed for following artificial satellites, just as Järnefelt had pointed out with pleasure.

Satellite observations were collected for publication, which could be used later to support joining COSPAR in 1964. Of course, this was not part of the original intention, because COSPAR materialised in the space research world only later, in November 1958. Finnish astronomers and geophysicists, once they got finally started, had no problems in joining the global success of the IGY. Thanks to the IGY space research matured and rose to a new level worldwide. Satellites played a significant role in that development, but the IGY raised that level when it brought to life a joint effort by the international community of unprecedented breadth.

In September 1954 the Minister of Education, Johannes Virolainen announced that the Finnish Government has the intention to sponsor the IUGG's XIIth General Assembly in Helsinki in 1960. This was to be the first grand-scale international meeting in Finland, one that proved to be a great success, the first in a series for Finland. The main topics in this meeting were the early IGY results.



Stamp issued in honor of the IUGG XII General Assembly in Helsinki in 1960 (Source: Finnish Post)

References: The main source of this article has been Ilkka Seppinen: *Suomalaisen Avaruustutkimuksen Historia*, Helsinki 2004 (The History of Finnish Space Research)