

IN MEMORIAM



Tor Bergeron

15 August, 1891–13 June, 1977

Synoptic meteorology—including weather forecasting—will probably for many years to come remain the most important branch of applied meteorology. It was due to a need for weather forecasts that the scientific discipline of meteorology was established in the years following 1860. The creation of a network of observing stations and of meteorological organizations was thus associated with a demand from society for reliable weather forecasts. At the start, however, no scientific basis for such forecasts existed, and *without* observations no scientific basis could ever be established. This state of affairs gave meteorology a bad reputation already from the very beginning and it is remarkable how synoptic meteorology for more than half a century pro-

gressed very slowly, in spite of the efforts of a few pioneers. The synoptic charts remained more or less the same: they were merely pressure-charts with a few other details added.

The research work of a group of meteorologists in Bergen, Norway, changed this state of affairs during the years around 1920 amounting to no less than a revolution in meteorology—as all meteorologists know. Within a few years, under the leadership of a theoretician, the physicist Vilhelm Bjerknes, these young and enthusiastic meteorologists created a new way of meteorological thinking. The experience of old age and the enthusiasm of youth in combination may be *one* explanation of this remarkable development.

The “inner circle” of the *Bergen school*, as the

group is generally known, consisted of Jack Bjerknes—the son of Vilhelm Bjerknes—Halvor Solberg and Tor Bergeron. None of these pioneers is now alive.

The findings of the Bergen school are well known to meteorologists all over the world. Still, it should be noted here that this small group introduced such fundamental concepts as airmass and airmass boundary—or front—and studied their properties, including the birth and development of middle-latitude cyclones. They also introduced a new analysis technique for the weather chart, a method which is still in use.

The group worked as a team, though different personal contributions may be recognized. Thus Bergeron introduced the arctic front and also the concept of the occluded front, which led to a modification of the first tentative cyclone model. Bergeron also later studied the tropical front over North Africa.

The opportunity to do such fundamental pioneering work is granted only a few. Tor Bergeron to a very high extent had the qualifications required. Ever since childhood he had been interested in observing the weather. He was to remain a keen meteorological observer during the rest of his life. He also possessed the ability to summarize information from a great number of observing stations into one fairly simple model of events. Last but not least, he had a bent for drawing, which is a great help in synoptic meteorology. His weather charts were in fact real pieces of art and—more than that—they summarized the meteorological events in the most clear way. He developed a practical system for the chart analysis containing a logical sequence of steps. His many pupils all over the world will forever remember the system.

Bergeron's doctoral thesis in 1928 "*Über die dreidimensional verknüpfende Wetteranalyse*" dealt with part of his research work in Bergen. This thesis was Part I of a planned series of four. In a shorter version a Part II was later to appear in Russian, but the series was never completed. A study in 1924 together with G. Swoboda had dealt with waves and cyclones which developed along a stationary front. Further we should also mention a paper in 1930, where the concept of a dynamical climatology was introduced.

The ideas of the Bergen school were not accepted at once by the weather services; in some cases this was to take 20 years or more. Instruction

was necessary, and Bergeron became the travelling teacher. In the capacity of almost a missionary he worked on Malta in 1928–29, in Moscow in 1930 and 1932, in USA in the 1940's and 1950's, in Yugoslavia in 1953. His visit to the Soviet Union, which at that time was an unusual event, was the result of a visit to the Bergen weather service in 1928 by the chief of the Moscow weather service, who was a member of the scientific staff on board the icebreaker "Krassin". This ship had taken part in the international rescue operations in the Spitsbergen area during the spring and early summer of 1928 following the crash of the dirigible "Italia" over the arctic pack-ice. On its way home the ship called at Bergen. Some months later a telegram from Moscow arrived with an invitation to either Jack Bjerknes or Tor Bergeron to serve as meteorological instructor in Moscow. Bergeron had the teaching abilities and he loved to go.

It should be noted that the woman, Vera Romanovskaja, who sent this telegram became Mrs. Bergeron a few years later.

Bergeron's lectures and instructions in chart analysis were attended by the most prominent meteorologists in the Soviet Union. Later, textbooks and instruction books appeared based upon his lectures.

In 1936 Bergeron returned to Sweden from Norway, where he had worked with the Norwegian weather service since 1922, first in Bergen, and from 1929 in Oslo. He was then employed by the Swedish weather bureau (now SMHI). It is interesting to observe the effects that his arrival had upon the analysis of Swedish weather charts. The Bergen ideas were now introduced, interesting weather developments were discussed, and last but not least, a review of meteorological history was given. For his lectures Bergeron possessed a unique collection of slides.

Bergeron remained with the Swedish weather bureau until 1947; he was at the same time lecturer of meteorology at Stockholm University. After the war there was an increasing demand for meteorologists. Therefore a professorship in synoptic meteorology was created at Uppsala University in order to supplement the already existing professorship, which was devoted to the experimental and theoretical aspects of the subject. Bergeron was offered the chair, which he then held until 1961. Even after his retirement he continued his scientific work, and not until the autumn of 1976, at the age of 85, was he forced by a severe illness to discontinue his work

at the Department of Meteorology, University of Uppsala.

Synoptic meteorology—and weather itself—was the principal scientific interest of Bergeron. He had, however, many other strings on his bow. In his youth for instance he intended to devote himself to atmospheric electricity. Later his connection to the Bergen school determined his career once and for all.

Weather is a synthesis of many processes and phenomena, among them the formation of clouds; the release and the distribution of precipitation; visibility, etc. With Bergeron's keenness and ability as an observer, these different branches of meteorology became objects for his study and interest. Bergeron was fascinated by the ever changing cloud formations and what they could tell about events going on in the atmosphere. The clouds also seemed to touch an artistic sense in his soul. He was a good cloud photographer, and several of his photographs are represented in the International cloud atlas. He never tired of emphasizing that students of meteorology should spend some time in the mountains occupied with observations on clouds and weather, as he himself did from his summer cottage. Cloud observations should also—with the same right—be made from the air, but Bergeron hated flying, or rather he refused to set his foot in an airplane. From his own cloud observations he was able to formulate his fundamental theory on the release of precipitation caused by the coexistence of droplets and ice-crystals in a cloud.

His great ability to systematize was of great use in the international meteorological work when setting up observational routines and instructions, such as cloud atlases, hydrometeor classifications, meteorological codes and symbols, etc.

During his Uppsala time his interest was concentrated upon a study of the horizontal meso-scale distribution of precipitation. For that purpose he established an extremely dense network of precipitation stations in the Uppsala region. This is characterized by wide plains interrupted by small hills and forests. He found that even such a fairly smooth topography exercised a profound influence upon the distribution of precipitation.

During his Uppsala years he also studied precipitation synoptically on a macro-scale and emphasized the importance of ordered vertical motions in the atmosphere for the creation of intense weather phenomena. The problem of the tropical hurricanes was included in these studies.

Tor Bergeron was descended from richly talented families. Apparently he had inherited gifts not only for science but also for literature, art and music, and he had inherited a spirit of adventure. His personality was a combination of all these different talents. He had a remarkable gift for foreign languages. Above all he had a *feeling* for languages; the right words and expressions should be used. He detested the modern way of importing words and of changing the meaning of words to popular doctrines. It was a privilege to have a manuscript inspected by him. He was extremely critical with his own manuscripts and proof sheets, and often he was therefore not popular with editors and printers. A tale is told that he tried to hold the express train starting from Bergen to Oslo, just in order to be able to make the manuscript of his doctoral thesis still more perfect before sending it away.

He liked looking back over the years in order to elucidate recent developments in science. His interest thus embraced meteorological history. As he had met and worked with many of the great persons in that science, his meteorological history was full of life.

His most profound interest, besides meteorology, probably was music. A concert was something which must not be missed. He was an active singer and a member of academic choirs until late in his life. He was a highly sociable person with a humorous outlook upon his fellow-creatures.

Tor Bergeron lived a rich life. Few have been given the privilege to devote a long life to contribute fundamentally to a basic field of science and few are given the possibility to take part in a great adventure—as the development of the Bergen school really was—and create meteorological history.

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