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INFORMAL AUTOBIOGRAPHY

of

HARALD ULRIK SVERDRUP

The name Sverdrup is originally Danish but has disappeared in Denmark. It was a farm name meaning "black new broken soil" (sverd probably related to the German schwarz, and rup related to the endings rud and roda and meaning "broken and cleared ground"). The first known person of the name to live in Norway appears to have arrived there around the year 1600, but all persons now living and bearing the name Sverdrup descend from my great-great-grandfather who had large land holdings in northern Norway. He had three sons, one of whom took over the farms, while the other two went to Copenhagen to study. Of these the older, Georg Sverdrup, studied classical languages and philosophy, and was appointed professor in Oslo (at that time Christiania) when the University was established there in 1815. He participated in the convention which prepared the present Norwegian constitution in 1814 and was one of the three persons who wrote the document. The younger brother, my great-grandfather, studied history, language and botany. Some time after returning to Norway he took over the management of some large estates in southern Norway where he soon accepted young men as apprentices. He became more and more interested in this instruction and in 1825 he bought his own farm and established the first agricultural school in Norway. Among his sons two reached considerable prominence. Johan Sverdrup, trained as a lawyer, entered politics and from 1851 to 1884 was a member of the Norwegian legislature (Storting) where he became the leader of the liberal party and after a long fight introduced the parliamentary system. His older brother, Harald U. Sverdrup, my grandfather, was a minister of the State Church of Norway (Lutheran), and served in a district in Sogn in eastern Norway from 1845 to 1883. He had very broad interests, was a representative in the Legislature (Storting) for about 20

years; was much interested in fruit growing and established the basis for the now very profitable fruit-growing industry of his district; he participated in organizing the first local steamship company; and established and directed the savings bank of the district.

My grandfather had five sons, all of whom became ministers of the Church, and three daughters who married ministers. My father was the youngest of the brothers. After completing his studies he first served several years as a teacher in an adult school in Sogn, was subsequently minister in two different districts in western Norway and in 1908 was appointed professor of church history at a private theological school in Oslo which was established by the conservative elements within the Church and which soon was authorized to prepare young men for service as ministers, that is, it was given the same status as the corresponding faculty at the University.

My grandfather on my mother's side was born on a small farm in southwestern Norway and, because of his native intelligence and perseverance, succeeded in entering the University and graduating from the theological school. He never became a minister of the Church but served as a deacon, as well as editor of a large newspaper. As an extra-curricular activity he published a textbook in arithmetic which for years was widely used in Norwegian schools. My grandmother on my mother's side had most of her ancestors among persons from Scotch families who had migrated to Norway in the 17th century.

I was born on November 15, 1888 while my father was teaching at the adult school in Sogndal, Sogn. In 1894 he became minister in the ~~MISSE~~ island district of Solund, about forty miles to the north of Bergen where he remained until 1898. From 1898 to 1908 he served as minister at Remusö, ten miles north of Stavanger, and from 1908 until his death in 1923 he lived in Oslo as professor of church history. I spent my boyhood in various parts of

western Norway and was instructed by governesses until I was nearly fourteen years old, at which time I was sent to school in Stavanger. I had to take a number of hard knocks coming as a boy from the country into a group of the more sophisticated youngsters of the city. At that time I had no idea as to what line of study I eventually might wish to follow although I had become much interested in natural sciences. In the late '90's a Danish series of publications had been launched under the general title "Frem" (Forward). This publication comprised a popular scientific periodical and popular books on a number of subjects ranging from astronomy to anthropology. My father subscribed to these publications and for the first time I became acquainted with the concept of evolution. I read everything I could come across and I must admit that the reading did upset me considerably, because it was difficult to reconcile the presentation of evolution with the first chapter of Genesis. I was also very much intrigued by articles on popular astronomy but at that time it did not occur to me that one could study these subjects at the University. Having been born and raised in a theological environment, study at the University was to me synonymous with studying theology. When I entered the "Gymnasium" in 1903 and had the choice between following the classical line with emphasis on Latin and taking science with emphasis on physics and mathematics, I selected the former. However, during my second year in the Gymnasium when I read every book in popular astronomy which I could find in the public library in Stavanger, and also learned that one could study natural sciences including astronomy at the University in Oslo, I decided that that was what I wanted.

I graduated with honors from the Gymnasium in 1906, but after a year in Oslo during which I passed the required preliminary examinations in philosophy and psychology, I decided that I would take advantage of the opportunity to obtain my compulsory military training in the Norwegian Academy of War, because

after spending 14 months there I would become a Reserve Officer, and I would be paid during my year of study and subsequently when taking part in repetition maneuvers. Therefore I attended the Academy of War from 1907-1908, and took the opportunity there to study physics and mathematics on my own and to take the examinations equivalent to those given when graduating from the Gymnasium. I have never regretted the year I spent in the Academy of War because much time was devoted to physical training. I have always been proud of the fact that I managed to overcome the handicap I had by not having had any rational physical training before I was 13 years old, and that I finished at the Academy of War as the top man in athletics. The training I got there has, I believe, been invaluable in later years.

In 1908 I returned to the University. In 1911 I passed my examinations in four minor subjects, physics, mathematics, chemistry, and botany. At that time I planned to major in astronomy, or more precisely, in the subject called "physical ~~geography~~ and astronomy" with emphasis on the latter. Physical ~~geography~~ included principally the subjects which now are referred to as geophysics, meteorology, oceanography, and terrestrial magnetism, with a small amount of physiography added. My plans were changed, however, because when instruction started in the fall of 1911 I was offered a job as assistant to Prof. V. Bjerknes who was engaged in applying ~~general~~ hydrodynamics to problems in meteorology and oceanography. Shortly after the establishment of the Carnegie Institution of Washington Bjerknes, who had paid a visit to the U. S. in 1904, received an annual grant from that institution in order to begin the preparation of several volumes dealing with the hydrodynamics of the atmosphere and the oceans. V. Bjerknes, who will be 86 in March, 1948, and still receives this annual grant, used it to employ young men as his assistants. A number of the present University professors of Norway, as well as several in the United

States, received their first opportunity to start in research, thanks to that grant from the Carnegie Institution of Washington. I do not know of any grant which has been used to better advantage and which has brought greater returns.

During my first year as an assistant to Bjerknes I still expected to major in astronomy, but after some time I got more and more interested in the problems in meteorology and oceanography and therefore changed to majors in the latter fields. In completion of the requirements for the Candidate's degree I wrote a meteorological thesis (my first published paper) and obtained that degree in 1914 with honors.

In the fall of 1912 V. Bjerknes was asked to accept a professorship at the University of Leipzig with the direction of a geophysical institute which was to be established. He asked his two Norwegian assistants, Mr. Th. Hesselberg, Director of the Norwegian Meteorological Institute since 1915, and myself to accompany him. We were both eager to do so and I therefore spent the years from January, 1913 to August, 1917 in Germany. In 1917 I submitted to the University of Oslo as a thesis for the doctor's degree a published paper on the North Atlantic tradewind (Der Nordatlantische Passat). The degree was conferred on me in June, 1917.

At that time I had already agreed to take charge of the scientific work on Roald Amundsen's contemplated North Polar expedition with the Maud which was launched on June 7, 1917. Amundsen had been working on the plans for that expedition since 1908 but in 1910 he turned towards the South Pole instead. In 1913 he resumed his plan and at that time the meteorologist, J. Birkeland, was to be in charge of the scientific work. I had been asked to accompany the expedition as his assistant but had refused because I wanted to complete my university training before joining any enterprise of that sort. In 1917 when the question of my participation again arose, this time with me in the

responsible position, I took the opportunity. I felt that since I had spent many years partly in theoretical work, partly in the discussion of observations which had been collected by others, it would be extremely valuable for me to spend a number of years in close contact with the events in nature and with the opportunity to get fully acquainted with various techniques of observation. *And I did not mind the adventure.*

The year 1917-18 I spent in preparing the scientific equipment and familiarizing myself with different types of instruments. The expedition left Norway on the 18th of July, 1918. Originally, we thought the expedition might last 3 or 4 years but, including an interruption of 10 months in 1921-22 which I spent in the United States, it lasted 7-1/2 years. I did not return to Norway until December 22, 1925.

I would not have missed the experiences of any one of these years. During the first year I gained an acquaintance with Arctic conditions which made it possible to rationalize our program; during the second and third years I had, in part, opportunity to carry out some more work in my own field, but the most interesting period was 8 months of 1919-20 which I spent among the reindeer Chukchi, one of the least known tribes of northeastern Siberia. The winter of 1921-22 was spent at the Department of Terrestrial Magnetism, Carnegie Institution of Washington, and initiated a happy association with that Department which later on was maintained for a number of years. During the last three years of the expedition we carried out a very intense program of observation and accumulated the material the analyses of which occupied the greater part of my time up to 1933.

Prior to my return to Norway in December, 1925, my friends there had taken steps to provide a position for me. V. Bjerknes who had returned to Norway in 1917 to accept the Chair of Meteorology at the Geophysical Institute

in Bergen had long desired to go back to the University in Oslo and had been promised that he could do so whenever he wanted. Now he took the opportunity to have that promise acted upon, thereby creating a vacancy in Bergen, and I was appointed as his successor with the specific understanding that for a number of years my main task would be to discuss the observations from the Maud expedition. I did not accept this position immediately but returned to the United States in February, 1926 and worked at the Department of Terrestrial Magnetism until October of that year, preparing a discussion of the observations in terrestrial magnetism and atmospheric electricity and of Aurora records made on the Maud Expedition.

In 1930 I again spent half a year at the Department of Terrestrial Magnetism, at this time engaged in the analyses and discussion of the oceanographic observations which had been taken on the last cruise of the Carnegie in 1928-29. I had acted as a consultant in the preparation of this cruise and had visited the Carnegie when she called at Hamburg in the summer of 1928.

In 1928 I married Gudrun Bronn Vaumann. We have no children, but I adopted Anna Margrethe, her daughter by her first marriage.

In 1931 when the Chr. Michelsen Institut was established I was offered a research professorship at that institute, the character of my work remaining unchanged. Besides completing the discussion of the Maud observations I became engaged in some other activities. In the summer of 1931 I participated in the Wilkins Ellsworth North Polar Submarine Expedition as leader of the scientific work, and in spite of the failure of the major object of the expedition some valuable information was gathered.

In 1934 I spent about eight weeks on one of the <sup>high</sup> ~~extending~~ snow fields of Spitsbergen with my friend the glaciologist, Dr. H. W. Ahlmann. I took detailed observations in the lowest layer of the air in order to examine the transfer of heat and water vapor from the atmosphere to the snow.



In December, 1935, the Director of the Chr. Michelsen Institut, Dr. B. Helland-Hansen, returned from a visit to the United States and told me that the Director of the Scripps Institution of Oceanography, Dr. T. W. Vaughan, was to retire in the summer of 1936, that my name had been mentioned as a possible successor, and he asked if I would consider taking that position at least for a limited number of years. I told him to inform the University of California that if the Michelsen Institut would give me leave of absence I would accept the position for a period of three years. In the spring of 1936 I was invited to accept the directorship of the SIO and the position as Professor of Oceanography at the University of California. I did so and arrived in La Jolla at the end of August, 1936, assuming my new duties on the first of September of that year. I hoped primarily, to be able to promote work at sea and to advance the Institution's activities in the field of physical oceanography. It soon became apparent that three years would not be enough to accomplish any of these ends and in 1938 my leave of absence from the Michelsen Institut was extended to five years. Before these years had expired the war came and I assumed at that time that my permanent place in the future would be with the University of California. Consequently, I took steps to become an American citizen and was naturalized in 1944. I should have remained here happily, not only because of the steadily improving facilities for work but even more because of the fine personal relationships which had been established from the very beginning with all those I had to deal with. It was a matter of great satisfaction to me that the fact that I was a foreigner in the country and spoke English with an accent never seemed to cause the slightest friction.

However, in the spring of 1946 I was asked by the Norwegian Government if I would consider returning to Norway to take the directorship of a Norwegian Polar Institute to be established. After several months of consideration I

agreed to do so, but stated that I could not be available until early in 1948 because of commitments to the University of California. At the time of writing I expect to leave the SIO in a few weeks and to tackle a new job, hoping that I am not too old to make the change. One of my main reasons for accepting this job is that I shall return to Arctic work, in which I have spent so many years of my life, at a time when international work in the Polar regions is more important than ever. I may be too optimistic, but I hope that because of my many connections in many countries, including the Soviet Union, I may be able to do more in that particular international field from a small country like Norway than can be done from most other countries. I also hope to continue participation in international work in oceanography, and it will be a particular pleasure to me if in the future a number of American students might find it of advantage to come to Norway for special training. Also I cannot help but feel that having spent by far the greater part of my life in Norway I should like to assist in work of importance to that small nation during a period when it is struggling to get back on its feet after five years of oppression.

La Jolla, February 6, 1948

H. U. Sverdrup

February 16, 1948

SUPPLEMENT TO INFORMAL AUTOBIOGRAPHY

The specific information asked for by the National Academy of Sciences has been covered in the preceding autobiography except important discoveries, positions held, honors and decorations. Information as to positions held, honors and decorations is found in the standard biographies in American Men of Science and Who's Who in America. To the information in these volumes the following should be added:

President, International Association of Oceanography, 1946 - ;

President, International Commission on Polar Meteorology of the International Meteorological Organization, 1947 - ;

LL.D., University of California, 1947.

Regarding "discoveries" which I consider the most important, I shall list the following:

(1) "Der Nordatlantische Passat", the discussion of the North Atlantic trade wind, which was submitted as a thesis for the doctor's degree at Oslo in 1917, and which led to the first consistent picture of the structure, dynamics and thermodynamics of that trade-wind region. This paper is, I believe, the most widely quoted of my contributions. The basic idea behind it was that during early summer the conditions were so nearly stationary that upper-air observations from different years could be combined and could be used for obtaining a complete three-dimensional picture. The presentations and the discussion were greatly influenced by the thinking of V. Bjerknes, whose assistant I was at the time. This paper was prepared in Leipzig during the first World War under certain difficulties, because I had to get along on the exceedingly small food rations which were available during the winter 1916-17, meaning that I was always hungry and always had difficulty in getting away from the thought of food. In the afternoon it often happened that I was unable to concentrate on my work because in spite of all efforts I soon found myself

thinking of food, and on many occasions I left my desk and went out hunting for something which could be obtained without ration cards. It surely wasn't much.

(2) "Dynamic of Tides on the North Siberian Shelf", in which the effects of the rotation of the earth and friction on the tidal currents and the dissipation of tidal energy were discussed. The analysis was suggested by the observations which were carried out during the drift of the Maud on the North Siberian shelf and the theory was developed on board. The paper was made ready for publication during the last winter in the Arctic. When preparing it the lack of sufficient literature and the lack of possibility for discussion with colleagues were felt seriously, and I spent many an hour pacing back and forth alongside the ship trying to find flaws in my approach. I had to tell myself that this was the best I could do and if I was mistaken it was just too bad!

(3) "The Oceans: Their Physics, Chemistry, and General Biology" (by H. U. Sverdrup, M. W. Johnson, and R. H. Fleming. 1037 pp., New York, Prentice-Hall, 1942). In this book the chapter on "Water masses and currents of the oceans" represents a synthesis of our knowledge and is the first attempt to deal with all oceans from a common point of view. The results have been very favorably received by colleagues. The preparation of the entire volume represented a great effort by my colleagues and myself, but this effort has been worth while because it has contributed a great deal to the present increased interest in oceanography by individuals, university departments, and government organizations.

(4) The studies of the relationships between wind, sea, and swell which were started by me (and my collaborator, Mr. W. H. Munk) in the fall of 1942, with specific war applications in mind. These studies led to the development

of methods for forecasting sea and swell and to a renewal of interest in ocean waves, resulting in important papers from the Scripps Institution of Oceanography and many other organizations.

(5) My very latest paper, "Wind-driven Currents in a Baroclinic Ocean; with Application to the Equatorial Currents of the Eastern Pacific", which was published in the Proceedings of the National Academy, vol. 33, Nov. 19, 1947. This, I believe, finally gives a rational explanation of the equatorial counter current and for the first time demonstrates that a quantitative relationship exists between prevailing winds and ocean currents.