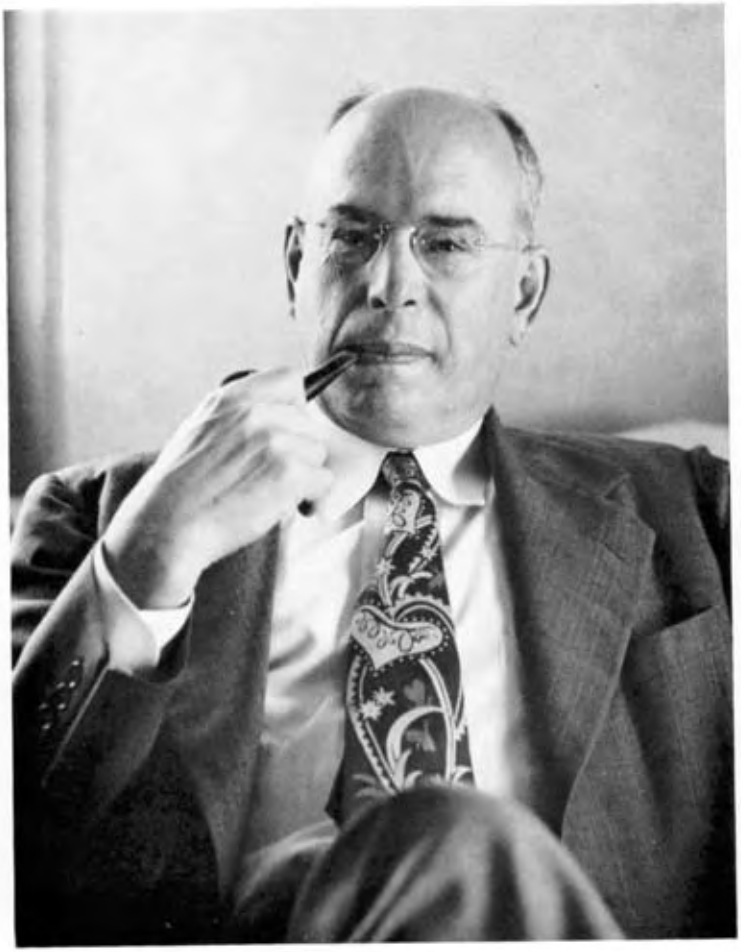
NATIONAL ACADEMY OF SCIENCES

RALPH ELMER WILSON

1886—1960

A Biographical Memoir by
ALFRED H. JOY

Biographical Memoir



Ralph E. Watson

RALPH ELMER WILSON

April 14, 1886–March 25, 1960

BY ALFRED H. JOY

THE MOST DIRECT APPROACH to the study of the fundamental problems of astronomy is based on the dynamics of either individual stars or systems of stars. In such studies, Dr. Ralph E. Wilson was a master worker. For more than forty years, with surpassing skill and never-failing enthusiasm, he endeavored to measure and interpret the motions of the heavenly bodies. His field was the whole sky from pole to pole, and he made use of the properties of widely differing celestial objects, varying from the two components of a spectroscopic binary or a few planetary nebulae to aggregates of thousands of stars.

Ralph Elmer Wilson was born in Cincinnati, Ohio, on April 14, 1886 and died in Corona del Mar, California, on March 25, 1960. His paternal great-grandparents emigrated from England about 1800 and settled for a time in northern New York State, but about 1850 they moved to Minnesota with several of their sons and homesteaded on farms near Northfield. There the grandparents, Thomas Wilson and Ann Couper, were married and raised a family of four sons and a daughter.

Ralph's father, Herbert Couper Wilson, the eldest of these children, was born in 1858. After graduating from Carleton College in 1879 and spending a year as a public school principal, he went to Cincinnati, Ohio, for graduate work in astronomy under the well-known Professor Ormond Stone, and later under Professor J. G. Porter. He served as Assistant in the Observatory in 1881–82 and,

after Stone left in 1882 for the McCormick Observatory in Virginia, as Assistant Astronomer, until 1886 when he was granted the Ph.D. degree, the first awarded by the University of Cincinnati. He had married Mary B. Nichols of Cincinnati in 1882. Ralph was born only two months before his father's degree was granted. Later, three sisters were to join the happy family group. The mother died March 14, 1924.

After a year as computer for the Transit of Venus Committee at the Naval Observatory in Washington, D. C., H. C. Wilson joined the Department of Astronomy at Carleton College, where he served as Professor and Director of the Goodsell Observatory for nearly forty years. He was also Editor of *Popular Astronomy* from 1896 to 1926. As a teacher H. C. Wilson was loved and admired by all who knew him. His observational contributions to astronomy were mainly in the field of comets and double stars. His death occurred on March 9, 1940.

With this background of devotion to astronomy, which prevailed in the Wilson home, it is not strange that Ralph found an abiding interest in the realm of the stars. Mathematical studies were easy for him and he found it entertaining to assist his father in astronomical computations and observations.

After graduating from Carleton College in 1906 Ralph continued his studies in Virginia with Professor Ormond Stone, with whom his father also had begun his graduate work at Cincinnati. No formal classes were held, but Ralph was encouraged to dig out for himself the methods used in astronomical computation and statistics. These studies were invaluable to him in his later research work.

After receiving his Ph.D. degree at Virginia in 1910, Ralph took over the activities of the astronomy department at Carleton College for a year in order to enable his father to enjoy a sabbatical at the Lick Observatory in California. He taught the general classes in astronomy, served as Acting Director of the Goodsell Observatory, and was Editor of *Popular Astronomy*. Observations and reports on

Halley's Comet, which was visible at that time, were undertaken in addition to this heavy program.

The next two years were spent at the Lick Observatory where, as Assistant Astronomer, he took part in the great spectrographic project of determining the radial velocities of all the brighter stars. This fundamental program set a standard of accuracy so high that it is barely exceeded at the present time, fifty years later. These observations at Mount Hamilton were in full swing under the vigorous direction of W. W. Campbell.

In 1913, Wilson transferred to the Southern Station of the Lick Observatory at Santiago, Chile, where he succeeded J. H. Moore. As Assistant Astronomer and later as Acting Astronomer he remained for five years in Chile in charge of the D. O. Mills expedition.

Before sailing for the southern hemisphere, Ralph Wilson and Mary Adelaide Macdonald were married in the library of the Lick Observatory. She was the daughter of John Macdonald, who had lived on Mount Hamilton as the much-esteemed engineer and mechanic from the time the building of the Observatory on the mountain was started. For almost fifty years. Mrs. Wilson devotedly shared the scientific and social activities of her husband. Wherever they lived their home was a center of abounding hospitality for their relatives and friends. Mrs. Wilson and their son Herbert Ralph Wilson survive him.

In order to properly balance the solution for the sun's motion with respect to neighboring stars, the observing station in Chile had been organized by Director Campbell for the purpose of obtaining radial velocities of southern stars corresponding to those determined at the Lick Observatory for northern stars. The Chile observatory was supplied with a 36-inch cassegrain reflector with which spectograms of the southern stars brighter than magnitude 5.5 were obtained for radial velocity determinations. By 1913, the stellar program was so far advanced that it could be extended to include the planetary nebulae. Preliminary observations of these strange objects indicated that their mean motions were even greater than those of the red

stars. This result had an important bearing on theories of stellar evolution prevailing at that time.

In Chile, Ralph Wilson undertook the difficult task of obtaining spectrograms of the southern planetary nebulae in addition to the work of finishing the general program of stellar radial velocities. The nebulae were extremely faint and their observation would have been entirely impossible except for the fact that their radiation is almost all confined to a few narrow emission lines. Even by utilizing this salient feature, the spectrograms required exposures of many hours on objects which were barely visible in the guiding eyepiece.

His observations of 18 bright-line objects in the Magellanic Clouds, yielding radial velocities from +160 to +300 km/sec, furnished the first and, for many years, the most convincing evidence that, since these systems were not moving with the sun and its neighbors in our galaxy, they must be extragalactic systems rather than outlying companions of our Milky Way system, and that they must be "related to the spiral nebulae." At about the same time V. M. Slipher had measured velocities of recession as great as 1100 km/sec among the brighter external galaxies. These results obtained by Wilson and Slipher were the stepping stones leading to the development of the remarkable cosmological world pictures developed by E. P. Hubble and M. L. Humason, and now known as the expanding universe.

Wilson also found time to observe numerous spectroscopic binaries and compute their orbits. He remained in charge of the observatory in Chile for five years. In his last year there he served as United States Representative in Chile of the Central Committee of the Allies. In July, 1918, he returned to the United States in order to take up active work in Washington with the Bureau of Aircraft Production.

After the war he joined the staff of the Department of Meridian Astrometry of the Carnegie Institution of Washington at the Dudley Observatory in Albany, New York, where for twenty years he took a leading part in various projects of the Department. He served as Secretary of the Department from 1923 to 1938. In addition to investigations concerning the site and program of a new observing sta-

tion for photographic astrometry, proposed by Director Benjamin Boss, his studies covered many fundamental properties of groups of stars and of the Galaxy as a whole. They were largely based on the stellar proper motions derived from meridian observations that were being accumulated at Albany. Among these investigations were corrections to the proper motions of the Boss Preliminary General Catalogue, solutions for the solar motion, and computations of real space motions of large numbers of stars. From these motions it was possible to make pioneering estimates of the mean distance and luminosity of various peculiar stars, such as the excessively red stars, the long-period variables, the cepheids, and the stars of spectral classes O and B. Shapley's zero point for the period-luminosity relationship of cepheids was essentially confirmed from the motions of fifty-one variable stars of this class.

Using the proper motions of 4200 stars and the radial velocities then available, the rotation of the Galaxy and the sun's distance from the center were determined. These values for the constants of the Milky Way system were among the first to be derived from analyses of stellar motions.

The membership of the Taurus and Ursa Major galactic clusters based on their proper motions was investigated and solutions for their apices made.

During the last five years of his stay at Albany, Wilson's time and efforts were devoted entirely to the mammoth task of checking and assembling the vast amount of material, which had been collected during the preceding twenty years for use in the *General Catalogue of 33,342 Stars*. He pushed to completion the publication of this Catalogue—one of the largest projects ever undertaken in the field of astrometry. Involving an outlay of nearly a million dollars, it was supported and published by the Carnegie Institution of Washington. In 1917 the Catalogue was printed in 1700 quarto pages in five volumes, providing data on the positions, precession, proper motion, magnitude, variability, spectral type, and duplicity of all stars brighter than magnitude 7.0 and many fainter stars of especial interest. The

meridian circle observations for the northern stars were made at Albany and, with the same instrument, for the southern stars at San Luis in Argentina. The proper motions were derived by comparison with all reliable previously determined positions and the extensive computations were carried out in duplicate. Wilson was largely responsible for the tedious and detailed work of the final operations. This prodigious effort is an invaluable source of data needed in all fundamental statistical research involving the dynamics of the galactic system.

After the completion of the great catalogue for which the Department of Meridian Astronomy had been set up, Wilson transferred in 1938 to another department of the Carnegie Institution of Washington, the Mount Wilson Observatory in California, where his talents for carrying out exacting projects involving the motions of the stars found ample scope. There, the scope of his activities was broadened because, in addition to data on the cross motions of stars, he was able to include motions in the line of sight that were obtained from spectroscopic observations made on Mount Wilson. He had previously become familiar with this method of approach during his years at Mount Hamilton and Santiago.

Using the space velocities computed from both of these motions, Wilson determined the mean distances and absolute magnitudes of several interesting classes of stars, such as the red variable stars of spectral types Me or Se and irregular or long-period light variation. The proper motions and luminosities of the O and B stars, the *c* stars of high luminosity, and the carbon stars of classes R and N were also investigated.

Using new radial-velocity material, the zero point of the period-luminosity curve of the cepheids was recomputed. The constants of the rotation of the Galaxy were determined from the motions of the distant O and B stars, the *c* stars, and the cepheids. Spectroscopic studies of a number of individual stars with peculiar features were also made.

The membership of stars in the Hyades cluster was investigated.

Mount Wilson radial velocity material was used and observations were extended to fainter stars. The point of convergence and the parallax of the cluster were determined. Most of the Hyades stars of spectral type G or later were found to have emission H and K lines of ionized calcium in their spectra. This interesting discovery led Wilson and Joy to compile a list of 445 stars whose spectra exhibit emission H and K lines. Calcium emission occurs in the sun and in many, but not all, stars of later spectral types. It is found in supergiants, giants, and subgiants as well as in main-sequence stars, but not in subdwarfs.

At the Mount Wilson Observatory, Wilson took a great interest in the programs that had been set up there for the radial velocity measures of a large number of stars of different kinds. In order to obtain the required number of spectrograms, hundreds of additional observations were made. The radial velocities of about 2000 stars were determined and published.

For use in his statistical studies, Wilson, about 1940, began a card file of all stellar radial velocities published subsequent to J. H. Moore's 1932 *General Catalogue of Stellar Radial Velocities of 6739 Stars*. This material was supplemented with unpublished results from several observatories up to January 1951, to form a new *General Catalogue of Stellar Radial Velocities,* which was published by the Carnegie Institution of Washington in 1953. For 15,100 stars this catalogue contains all the radial velocities determined at numerous different observatories and their weighted mean values. In addition, it supplies data with reference to positions, proper motions, spectral type, magnitude, and duplicity of the stars. Here again, Wilson's extraordinary capacity for gathering and organizing a vast amount of scattered material was brought into action. This catalogue has been of the greatest usefulness to astronomical research involving stellar dynamics and statistics.

Following his retirement from the Mount Wilson and Palomar Observatories on May 1, 1951, Dr. and Mrs. Wilson moved to the Pacific coast at Corona del Mar, largely on account of her health.

Several of their relatives lived near by and Ralph gave considerable time and effort, as long as he was able, to family matters, especially to the operation of a food market which was managed by his son.

On March 25, 1960, Ralph Wilson died in a near-by hospital following surgery and a long struggle with cancer.

Wilson was held in affectionate esteem by his fellow workers. He was a fine and loyal friend. His buoyant and genial personality made him a delightful companion in any situation. He loved to spend a social evening with his friends or to have an afternoon on the golf course.

As an observer at the telescope he was a diligent and skillful operator and his results at the measuring machine were of the highest accuracy. By careful planning beforehand, time was conserved and precision maintained. In his research projects his keen, penetrating insight pointed out the proper choice of material and the correct method of attack. Some of his largest and most time-consuming astronomical undertakings were concerned with collecting and evaluating material for the use of others at a later time. The compilations were of basic value, but they were detailed and lengthy; nevertheless, he gave them his willing and most scrupulous attention over extended periods of time.

When called upon, Wilson was always glad to be of service wherever he was needed. In 1910–11 he served as Director of the Goodsell Observatory and Editor of *Popular Astronomy* at Carleton College. In Chile he was in charge of the Mills Expedition of the Lick Observatory for five years. At the Dudley Observatory, he was Secretary of the Department from 1923 to 1938. He served as Associate Editor of *Popular Astronomy* from 1911 to 1914, and of the *Astronomical Journal* from 1929 to 1950. He was elected President of the Astronomical Society of the Pacific in 1946 and was Councilor of the American Astronomical Society, 1934–37. During the Second World War, he contributed much time to the work of the Federal Office of Scientific Research and Development.

His successful completion of a considerable number of extensive

investigations and exacting projects of lasting usefulness in the progress of astronomy was a source of deep personal satisfaction to Ralph Wilson. He also appreciated the many tokens of esteem which were bestowed upon him by his fellow workers in his chosen field. Perhaps, the recognition that he prized most highly was the dedication to him, at the time of his retirement in 1951, of a symposium at a meeting of the Astronomical Society of the Pacific on "The Radial Velocity Programs of the Pacific Coast Observatories." Methods and results of observations in this field were discussed by astronomers from the Dominion Astrophysical, the Lick, and the Mount Wilson Observatories. At that time, Wilson presented his plans for the new *General Catalogue of Stellar Radial Velocities.*

In 1926, Dr. Wilson was awarded the Gold Medal of the Royal Danish Academy of Sciences. He took an active interest in various societies for astronomical promotion and scientific cooperation, such as the American Astronomical Society, the American Association for the Advancement of Science, the Astronomical Society of the Pacific (President in 1946). As a member of the International Astronomical Union he was placed on commissions for Stellar Parallaxes and Proper Motions, for Stellar Radial Velocities, for Selected Areas, and on a subcommission for Wave Lengths. In 1950, he was elected to membership in the National Academy of Sciences.

In the field of astronomical research Ralph Wilson will be remembered for his pioneering investigations of the motions, distances, and luminosities of various classes of stars, and for his painstaking devotion to the laborious task of compiling and publishing volumes of data required by investigators of stellar and galactic dynamics.

CHRONOLOGY

1886	Born April 14 in Cincinnati, Ohio.
1887–1906	Northfield, Minnesota.
1902–06	Carleton College.
1906–10	McCormick Observatory.
1909	Member, American Astronomical Society.
1910	Ph.D., University of Virginia.
1910–11	Acting Director, Goodsell Observatory.
1910–14	Associate Editor, *Popular Astronomy*.
1911–13	Lick Observatory.
1913–18	In charge, D. O. Mills Expedition, Santiago, Chile.
1917	Member, American Association for the Advancement of Science.
1918	Bureau of Aircraft Production, Washington.
1918–38	Department of Meridian Astrometry, Carnegie Institution of Washington, Albany, N. Y.
1926	Gold Medal of the Royal Danish Academy of Sciences.
1929–49	Associate Editor, *Astronomical Journal*.
1934–37	Councilor, American Astronomical Society.
1938–51	Mount Wilson Observatory of the Carnegie Institution of Washington.
1939	Member, Astronomical Society of the Pacific.
1946	President, Astronomical Society of the Pacific.
1948	Member, International Astronomical Union.
1950	Member, National Academy of Sciences.
1951	Retired, Corona del Mar, California.
1960	Died, March 25.

KEY TO ABBREVIATIONS

Astron. J. = Astronomical Journal
Astrophys. J. = Astrophysical Journal
Astron. N. = Astronomische Nachrichten
Astron. Soc. Pac. Leaflet = Astronomical Society of the Pacific Leaflet
Carnegie Inst. Wash. Pub. = Carnegie Institution of Washington Publication
Lick Obs. Bull. = Lick Observatory Bulletins
Lick Obs. Pub. = Lick Observatory Publications
Pop. Astron. = Popular Astronomy
Proc. Nat. Acad. Sci. = Proceedings of the National Academy of Sciences
Pub. Am. Astron. Soc. = Publications of the American Astronomical Society
Pub. Astron. Soc. Pac. = Publications of the Astronomical Society of the Pacific

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