

“THE ROYAL ROAD TO SUCCESS”:
HENRY NORRIS RUSSELL (1877–1957)

OTTO STRUVE

Berkeley Astronomical Department
University of California

On December 28, 1946, Henry Norris Russell delivered the first of the series of Russell Lectures established in his honor by the American Astronomical Society, at Longfellow Hall of Radcliffe College. The opening paragraph of his lecture contains the best possible description of his own approach to science. It is as follows:

“From immemorial antiquity, men have dreamed of a royal road to success—leading directly and easily to some goal that could be reached otherwise only by long approaches and with weary toil. Times beyond number, this dream has proved to be a delusion. The easy way has ended in an impasse, and the right track has led up the hill Difficulty. This has been so invariable an experience that the very suggestion that there might be a royal road is hardly to be mentioned in polite society—whether of scholars, statesmen, or saints. In the larger sense, this distrust is fully sound. We cannot expect nor hope to get anything worth while without working for it. Nevertheless, there are ways of approach to unknown territory which lead surprisingly far, and repay their followers richly.”

Russell then spoke of his own work, and that of his pupils, on eclipsing binaries and added: “There is probably no better example of this [the royal road] than eclipses of the heavenly bodies,” and in conclusion he modestly stated that “this talk has been no complete guidebook to the royal road. At best, it may have given a glimpse of some of the profitable realms to which it leads, and some good reasons for an increase of traffic on it.”

Those who knew Professor Russell realize that throughout his life he never departed far from one royal road or another. It is probably safe to say that within the memory of living men he has not only discovered the greatest number of royal roads in astronomy, but has graded and paved them with his own researches to such an extent that traffic now flows over them



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smoothly and we are apt to forget that they were not always there.

Among the many roads which he thus laid out, there are five that deserve our particular attention:

1. His work on stellar evolution, which had its beginning at the December 1913 meeting of the American Astronomical Society at Atlanta, Georgia. To an audience of only twelve astronomical members of the Society he read a paper on "Relations Between the Spectra and Other Characteristics of the Stars." In this address he discussed the properties of what is now known as the Hertzsprung-Russell diagram (E. Hertzsprung had anticipated some of Russell's results in his studies of galactic clusters). From this diagram sprang Russell's own work on stellar evolution as well as that of A. S. Eddington, and all their numerous followers. This phase of Russell's work—especially in its initial stages—was well described by Alfred Fowler on the occasion of the presentation to Russell of the Gold Medal of the Royal Astronomical Society in 1921 (*M.N.R.A.S.*, **81**, 334, 1921).

2. His development of the theory of eclipsing binaries, which he summarized in his Russell Lecture of 1946 (*Harvard Observatory Monograph* No. 7, p. 181, 1948).

3. His long series of investigations on the analysis of the line spectra of the chemical elements.

4. The application of his work on atomic and molecular spectra to the determination of the physical conditions in stellar atmospheres. Together with W. S. Adams he made the first reliable determination of the abundances of the elements in the universe. Even today we speak of the "Russell mixture" of elements in stellar interiors as well as in stellar atmospheres, and for a number of elements we still fall back upon the abundances derived by Russell and Adams.

5. His work, partly in collaboration with Charlotte E. Moore, on the dynamical parallaxes and masses of the visual double stars.

Henry Norris Russell was born on October 25, 1877, at Oyster Bay, New York. He spent nearly his entire life at Princeton. He studied astronomy under Professor C. A. Young, and in 1912 became his successor as director of the Princeton University Observatory. In the interval between 1903 and 1905 he served as

Carnegie Assistant at the Observatory of the University of Cambridge and was there engaged in adapting photographic methods to the determination of stellar parallaxes. In 1947, upon his retirement as research professor at Princeton University and as director of the Observatory, he was succeeded by Lyman Spitzer, Jr., who had been one of his pupils. He continued to attend colloquia and other astronomical meetings until almost the end, which came on February 18, 1957. He had many honorary degrees and was the recipient of many medals and prizes. In 1925 he was awarded the Bruce Gold Medal by the Astronomical Society of the Pacific.

He had a lively interest in many subjects other than science. He enjoyed his many trips abroad and could speak entertainingly for hours about the antiquities of Egypt and Greece or the scenic beauties of the Alps and of Spitzbergen. The keenness of his mind was sometimes a little frightening to his less-gifted astronomical colleagues: I remember one occasion when I took him in my car from Chicago to the Yerkes Observatory (after he had been awarded the honorary Sc.D. degree by the University of Chicago) and he plied me with questions on a variety of topics, such as the motion of the moon, which I was unable to answer. But when he was our house guest at the time of the dedication of the McDonald Observatory, he relaxed completely in enjoyment of the splendid view from our porch across the Davis Mountains into the plains at the Mexican border.

He was a frequent speaker at the meetings of the American Astronomical Society and other scientific gatherings. His criticisms could be severe: he might rise at the close of a paper and destroy a carefully prepared theory with a single sentence. But he could be equally generous in his praise. For him there was only "right" and "wrong" in science; he rarely bothered to discuss papers that contained a mixture of the two.

His influence upon the development of theoretical astrophysics in America was enormous. Among his students at Princeton were Shapley, Dunham, Menzel, Spitzer, F. B. Wood, B. W. Sitterly, and many others who have carried his ideas far and wide. As a research associate of the Mount Wilson Observatory he influenced the trend of the observational work of Adams, with whom

he collaborated on many occasions, and also that of a large number of other Pasadena astronomers. He exerted a similar influence at the Harvard College Observatory, and some of the finest advances resulted from his early recognition of the great ability of Cecilia Payne-Gaposchkin, and from their frequent informal discussions of astrophysical problems.

The two textbook volumes on *Astronomy* by Russell, R. S. Dugan, and J. Q. Stewart have probably been used by all present-day astronomers, and they have not been surpassed during the thirty years since they were first printed. Russell took great pride in the fact that I. S. Bowen's discovery in 1927 that the "nebulium" lines in gaseous nebulae are produced by forbidden transitions of the atoms of doubly-ionized oxygen had, in part, been stimulated by the following sentences in the second volume of the book: ". . . it is now practically certain that they [the 'nebulium' lines] must be due not to atoms of unknown kinds but to atoms of known kinds shining under unfamiliar conditions. . . . The suggestion is tempting that the nebular lines may be emitted only in gas of very low density."