of the women were employed full-time and another 13 percent part-time. Their overall achievement levels (based on salary, prestige, and the like) show 48 percent at High or Good and the rest at Fair or Low. Some techniques for accommodation of family and occupational lives are delimited and presumably more will be detailed in a second volume yet to be issued (*7*). I would draw somewhat different inferences from those the authors draw from their data on sources of satisfaction, but this may in part be because of the somewhat confusing presentation. They found no relationships between overall satisfaction with life and work pattern, or achievement level, but my guess would be that the degree of overall satisfaction is a reflection of the degree of self-actualization felt (which is more importantly related to work for some than for others), and this is too individually varied to appear clearly. In Mulvey's group, overall satisfaction was more consistently related to marriage than to anything else, but this does not hold for these women.

It is not feasible to comment here on a number of other aspects reported in the study (such as fields of work, fields of academic concentration, community activities), but mention must be made of the categories the authors have developed for "life styles" (which "do not reflect any preconceived social or psychological theory"). These are (i) *individualistic* (with emphasis on self-direction and self-determination), 52 percent; (ii) *influential* (strongly motivated to make an impact on others), 10 percent; (iii) *supportive* (basically oriented to service to others), 29 percent; and (iv) *communal* (committed to a religious, ideological, or political systems), 9 percent. These categories are related to working and nonworking and to personal values as would be expected.

Throughout there are many rich insights both in the authors' comments and in the numerous quotations from their subjects, and their discussion of the role of work in women's lives (and their limited comparisons with men) as well as the implications for social policy should not be abridged. They return to their theme of increasing options, which they note as also increasing, but laggingly, for men. They do not, however, deal with a problem which is becoming more and more apparent to those concerned with career studies and career guidance—that a wide array of options is only advantageous to the extent that they are clearly perceived and that active weighing of alternatives can be done and rational choice from among them can be made—a skill not widely developed (*8*).

This careful study is a most welcome counteractant to the flood of books and papers bewailing the sad lot of womankind. Perhaps a time is in sight when society will have learned to use the talents of all its members and to exploit individual and group differences rather than to minimize or deplore them.

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6. One would guess that the mean income is also relatively high. As with a number of the statistical details, the presentation is not very satisfactory for comparative purposes. Here, for example, no mean is reported—only that one-fourth earn less than $10,000 and one-fifth earn more than $20,000.
7. To be called *Educated American Women: Self-Portraits*.
8. See, for example, A. Roe and R. W. Baruch, "Factors Influencing Occupational Decisions: a Pilot Study," *Harvard Studies in Career Development No. 32*; and D. V. Tiedeman and E. D. Morley, "Guidance and Vocational Competence: A Theory for Ideal Practice," *Harvard Studies in Career Development No. 43* (Center for Research in Careers, Graduate School of Education, Harvard University, Cambridge, 1964, 1966).

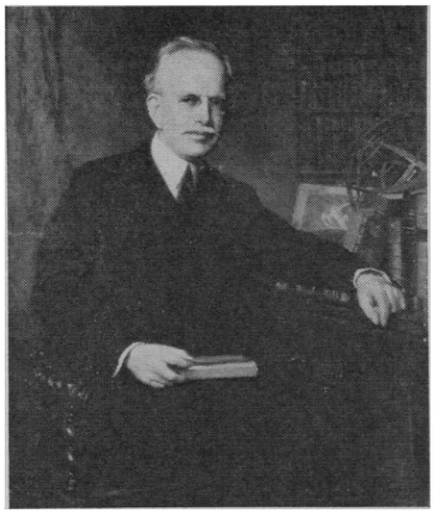
## A Pioneer in Astrophysics

More than any other individual, George Ellery Hale was responsible for the 20th-century boom in astrophysics. His creative genius, which turned to the design of instruments and establishing scientific organizations and large observatories, has been commemorated in the spectroheliograph, the International Astronomical Union, and Mount Palomar's 200-inch Hale Telescope. In the biography **Explorer of the Universe** (Dutton, New York, 1966. 480 pp., illus. $10) Helen Wright gives a detailed account of the life and almost frantic activities of this remarkable scientific leader.

As a young astronomer at the Yerkes Observatory 25 years ago, I heard and retold many stories about Hale—the man who at the age of 24 persuaded C. T. Yerkes to borrow half a million dollars to build the largest (40-inch) refractor in the world, and then moved on in ten years to build the Mount Wilson Observatory. Now I find many more stories resurrected from the vast file of Hale's papers at Caltech—stories of the undergraduate Hale disliking the grind at M.I.T., "barging in" on E. C. Pickering at Harvard, Rowland at Johns Hopkins, Young at Princeton, William Huggins in London, and Deslandres at Meudon, and weathering a storm on Pikes Peak in 1893. What's more, this book sheds light on the fortunate combination of circumstances that led to Hale's accomplishments.

Wright carefully sets Hale's life in historical perspective, relating it to such events as the Chicago fire of 1871 when Hale was 3 years old, prosperity in the 1880's, the depression of 1893, developments in physics and astronomy, the war years 1914–1918, and the roaring twenties. She recounts in great detail some of the less significant personal events in Hale's life, but generally she succeeds in showing his vast personal strength. In a few paragraphs she gives the background and personality of each of the many renowned scientists Hale met, and the descriptions of these meetings indicate the overpowering personality and infectious enthusiasm of the central character.

Part of Hale's influence undoubtedly derived from his early interest in optics and technology, which made possible his applications of the new physics in the old science of astronomy. Of course, in 1890 the time was ripe for shifting emphasis from where things are in the sky to what the things are like—what composition, how hot, in what magnetic field, how moving. Other scientists, such as Pickering, Huggins, and Lockyer, had similar ideas, but this biography shows that a second happy circumstance, an economic one, gave Hale far better opportunity to exploit his youthful interests. The prosperity of



George Ellery Hale (1868–1938). [Photograph by George F. Clifton from a painting by S. Seymour Thomas]

Chicago in the 1880's and his father's successful elevator-manufacturing business made it possible for young George to have an expensive telescope, to visit Connecticut each year, to travel widely, and to attend M.I.T. The breadth and experience gained from this upper-middle-class life probably gave him the confidence to "barge in" on established authorities and to ask for contributions in money and effort that were unusual in scientific circles at the time. His early successes led to larger and larger ventures, culminating in the 200-inch telescope. Many of the advances in astronomical thought concurrent with Hale's telescope-building are summarized in Struve and Zeberg's *Astronomy of the 20th Century* (Macmillan, 1962). The instruments and observatories themselves are described in a book I have just completed, *Telescopes* (Macmillan, 1966).

Hale started at the age of 12 by recruiting his younger brother and sister as lab assistants and observers. He soon got gratings from Rowland and optical parts from Brashear, and, later, in 1895, help from physicists in establishing *The Astrophysical Journal*. He continued with organizing the American Astronomical Society, the California Institute of Technology, the Huntington Library, the National Research Council, and the International Astronomical Union. He attracted astronomers and physicists from all over the world to visit the Mount Wilson Observatory and Caltech, and he encouraged research efforts in almost every aspect of astrophysics. His notes and letters reveal that he recognized the problems of solar flares, solar influence on the earth's magnetosphere, stellar evolution, rotating and magnetic stars, the distances and sizes of galaxies, and magnetic fields in galaxies—all of them long before they became as popular subjects of study as they are today. For most of these, he proposed new observational techniques, such as motion pictures of prominences.

In summarizing astrophysical events of the years 1880 to 1950, as recorded in the many letters, journal notes, and papers of the Hale collection, Wright has provided a useful and fascinating account of scientific development that led to the preeminence of the United States. Hale's preoccupation with building and using the best possible instruments slants this account properly toward achievements in observation rather than in astrophysical theory. Readers with a background in physics and astronomy will recognize many of the important developments in solar physics, astronomical spectroscopy, and cosmology. Anyone who has prepared proposals for NSF, NASA, or other research grants will marvel at Hale's success in gaining support for his big ideas when he had to approach individual donors personally, taking account of their idiosyncracies and explaining later changes in plan. In these early years of "big money" research, C. T. Yerkes established his name with less than $800,000 for the observatory near Chicago, Andrew Carnegie with $10 million for the Institution that started the Mount Wilson Solar Observatory with $10,000, and John D. Hooker with $45,000 for the 100-inch telescope. Hale's meetings and correspondence with these wealthy men sound like excerpts from 19th-century novels, with their Victorian formalities and Edwardian innuendoes. In between, Hale presented papers on solar prominences and sunspots and their magnetic fields, wrote a book on stellar evolution, and received almost every scientific honor granted in the western world except the Nobel Prize (which is not offered in astronomy).

Because Hale's activities covered so wide a range, his biography could be written in many different ways. Wright has covered his contributions to astrophysics well and explained them in simple terms, illustrating her account with photographs and diagrams. Readers who know today's Chicago, Boston, Pasadena, or Washington will find many interesting accounts of life in these cities 40 to 80 years ago. Wright also emphasizes Hale's many friends, mostly physicists and astronomers whose names are now well known, and also biologists, chemists, engineers, geologists, architects, and archeologists—the inner fraternity of early 20th-century science. The nature of her basic material—letters, diary notes, reminiscences of relatives and a few old friends —leads to somewhat more emphasis than I would give on family illness and Hale's nervous disorders in 1910–1911 and may account for her neglecting certain aspects of his activities for the National Research Council in World War I. But there is an overall balance in *Explorer of the Universe*; it shows that George Ellery Hale was a man who picked significant things to do and then got them done.

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## Forest Problems in China

**Forestry in Communist China** (Johns Hopkins Press, Baltimore, 1966. 255 pp., illus. $6.95), by S. D. Richardson, is the story of Red China's forest problems and of her efforts to solve them. But even more, it is the story of a country which supports nearly one-quarter of the earth's peoples and is faced with the most gigantic land problem that history has ever recorded.

Richardson is director of research for the New Zealand Forest Service, and now visiting professor at the University of Wisconsin. In 1963, he toured China, conferred with forestry officials and other scientists, and obtained access to many of their records. The result is a timely and competent contribution to forestry literature. It is, in effect, the first comprehensive account of China's forestry activities and of her forest industries.

The book's objectivity is apparent on every page. Richards writes as one neither for nor against Communism. He is concerned solely with setting down facts, as he saw them and as he evaluates them, and their probable role in China's future. Yet, in a very real sense, the book deals with a problem more basic to China than Communistic ideology or military supremacy. It deals with the very source of life to China's teeming millions—water and land. For forestry, in its protective aspects, is probably of greater