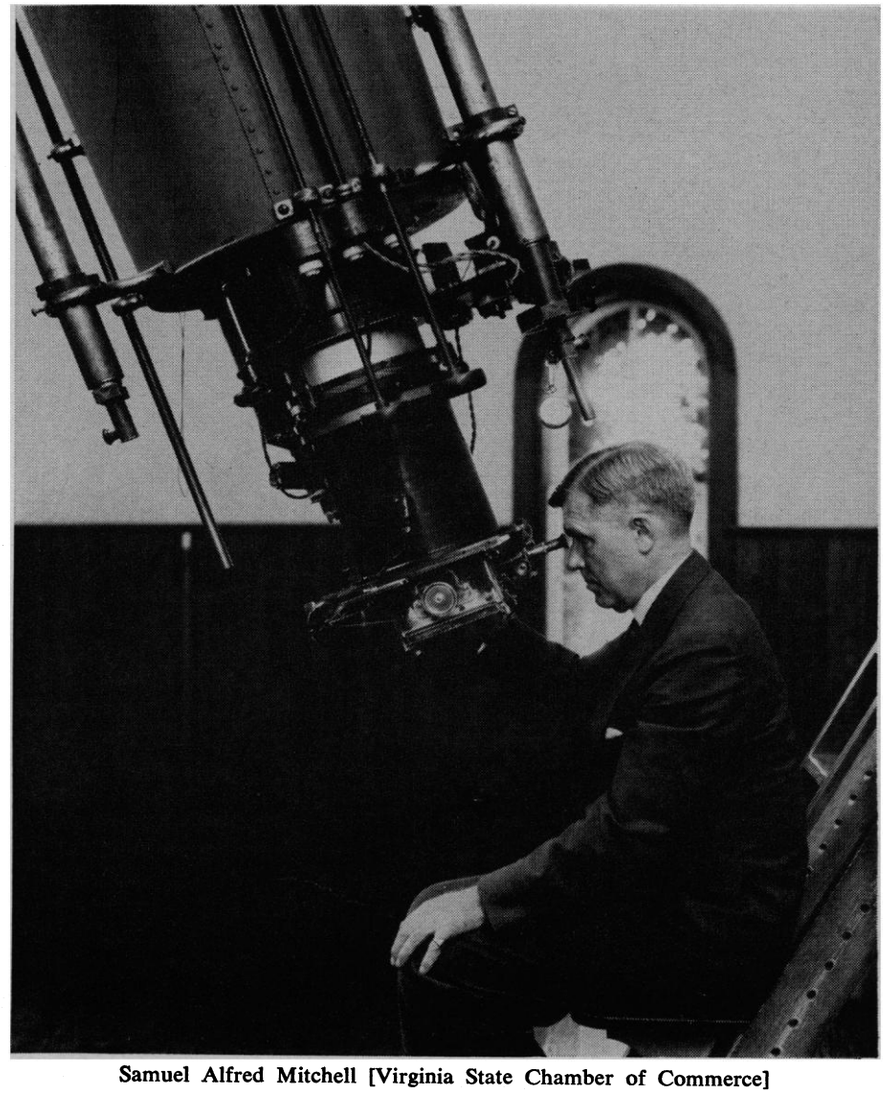
Samuel Alfred Mitchell, Solar and Stellar Astronomer

Samuel Alfred Mitchell was born in Kingston, Ontario, on 29 April 1874 and died in Bloomington, Indiana, on 22 February 1960. He received the master of arts degree at Queens College in 1894 and the degree of doctor of philosophy in astronomy at Johns Hopkins in 1898, then spent one year at the Yerkes Observatory as research assistant in astronomy. From 1899 to 1913 he taught at Columbia University. In 1913 he succeeded Ormond Stone as professor of astronomy and director of the Leander McCormick Observatory of the University of Virginia. He became director emeritus in 1945.

Mitchell's scientific activities broadly covered three fields: stellar parallax and related problems, variable stars, and solar eclipses. During his 32 years of directorship, the McCormick Observatory developed into an important center of astronomical research. One of the most urgent astronomical problems at the beginning of the 20th century was that of determining stellar distances. In 1907, and again between 1909 and 1913, Mitchell participated in the pioneering work of Frank Schlesinger on the determination of trigonometric stellar parallaxes from photographs taken with the long-focus refractor of the Yerkes Observatory. Mitchell attacked this problem with the 26-inch McCormick refractor, following Schlesinger's methods. With the assistance of C. P. Olivier (now director emeritus of the Flower and Cook Observatory), H. L. Alden (the present director of the McCormick Observatory), and numerous others, Mitchell made the McCormick Observatory into one of the leading observatories contributing to photographic parallax determinations. A first volume (McCormick Observatory *Publications,* vol. 3), containing 260 parallaxes, was published in 1920, to be followed by volumes 4, 8, and 14; the work is being continued.

In 1922, the Dutch astronomer Kapteyn pointed out the potential importance of parallax plates for the determination of accurate proper motions, particularly in regions centered on bright stars, and the importance of these findings for the determination of proper motions of faint field stars, referred to the system of the bright stars. Mitchell and Alden recognized the significance of this new field, which now became an additional program of the McCormick Observatory. Mitchell invited Peter van de Kamp from the Kapteyn Astronomical Laboratory in Groningen to participate in this work, which was destined to continue for several decades and led to important statistical knowledge of the motions of faint stars, such as the determination of preferential motion, solar motion, galactic rotation, and precessional constants. This proper-motion work reached its highest activity during the 1930's and 1940's, as carried out by A. N. Vyssotsky and E. T. R. Williams. The results of the work are found primarily in volumes 4, 7, and 10 of the McCormick *Publications.*

Another development of the original parallax work was the determination of mass ratios of binary stars which had been photographed over several decades. A further by-product of the initial parallax program was the occasional discovery of perturbations of single stars, which pointed to the existence of unseen companions. The classi-



Samuel Alfred Mitchell [Virginia State Chamber of Commerce]

cal photographic example is the faint red dwarf star Ross 614, which has a perturbed motion first discovered, in 1935, by D. Reuyl at the McCormick Observatory. Twenty years later, from subsequent studies at the Sproul Observatory, the location of the companion star was predicted, and the companion was both seen and photographed with the 200-inch Hale telescope at Palomar Observatory. A number of other perturbations have since been discovered at the McCormick Observatory and await further analysis. Various other aspects of double-star work were carried out under Mitchell's directorship.

In 1926 Mitchell initiated the taking of first epoch plates of Cepheids for the purpose of ultimately testing the zero point of the period luminosity curve. A similar program on long-period variable stars was also begun some time later.

The second area of Mitchell's activity was visual observation of variable stars. Again assisted by Olivier, Alden, and others, Mitchell observed a large number of long-period variable stars; with the McCormick telescope, stars down to the 15th magnitude or even fainter could be observed. This work included the determination of standard magnitudes for the comparison stars, used now by the American Association of Variable Star Observers. Mitchell also established visual photometric standards in selected areas of the sky.

Thirdly, Mitchell devoted considerable time to the observation of total solar eclipses. Between 1900 and 1934 he traveled to observe some ten total eclipses and obtained excellent photographs of several of them. He was particularly proud of his photograph of the "flash" spectrum of the chromosphere, taken when he was in Spain in 1905. With the collaboration of E. T. R. Williams and of Rupert Wildt, Mitchell derived important astrophysical information from these spectra. His book *Eclipses of the Sun*, published by the Columbia University Press, has gone through several editions.

Numerous other phases of astronomical work were started under Mitchell's directorship, such as Vyssotsky's discovery and study of nearby red dwarfs from objective-prism spectra taken with a 10-inch refractor. The same instrument has been used to supply spectral classifications of over 100,000 stars to several other observatories.

For several years, Mitchell was chairman of Committee A, on Academic Freedom and Tenure, of the American Association of University Professors and contributed to the work of this important committee.

Upon reviewing my 14 years' association (1923–1937) with Mitchell, I am impressed by the prodigious amount of work that was done under his directorship. Over the years, he gathered around him a number of dedicated astronomers who, operating on a small budget, with a minimum of secretarial and computational assistance, reached a vigorous rate of productivity. In addition to the enthusiasm of Mitchell and his co-workers, the fine quality of the 26-inch objective and the Virginia climate, one of the best for astronomical observation along the Atlantic seaboard, were factors in this productivity. That the small staff of the McCormick Observatory achieved so much was due, in no small measure, to the organizational qualities and the energetic directorship of Samuel Alfred Mitchell.

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Science in the News

Thinking about Disarmament: The Search for a Policy Turns Up Several Apparent Paradoxes

There has been a general increase in research on the problem of disarmament, dating from 1958 when the apparent progress being made at the Geneva test ban negotiations led to a feeling that the time might be right for at least some modest progress in other areas of arms control. The research has reflected a new and still evolving attitude among policy makers, who have tended in the past to regard disarmament negotiations as something which has to be undertaken for the sake of impressing the world with a nation's peaceful intentions but from which no real progress is to be expected. Interest in research on disarmament continues, despite the collapse of the Geneva disarmament negotiations and the present precarious state of the talks for banning nuclear weapons testing.

One fundamental difficulty in obtaining disarmament, as has been pointed out by Hans Morgenthau, of the University of Chicago, is that, without an international judiciary with the power to enforce its decisions, a nation is able to protect its interests, ultimately, only by the use or threat of use of military power. Consequently, disarmament can only follow, not precede, a relaxation of the tensions which have brought on an arms race. The value of such arms limitation agreements as might be reached is likely to be wholly illusory, as was, for example, that of the widely hailed Kellogg-Briand pact of 1928, which pledged its signatories to renounce war as an instrument of national policy.

Currently, research on disarmament is being conducted at the Rand Corporation, Santa Monica, California, which is a nonprofit organization supported primarily by the Air Force, and at several centers of international affairs at leading universities, with support by government and private grants. Until recently the program at Rand involved the part-time efforts of 12 men, but the research is being expanded.