pletely assimilated, indicating more mixing but less assimilation. Local diastrophism emplaced the several small bodies of granite and the numerous small, local bodies of other granitic rocks.

*Basement influence on Rocky Mountain structures:* ROLLIN T. CHAMBERLIN. The more the Rocky Mountains are studied, the more it becomes evident that pre-existing structures and strength variations in the underlying basement rocks have had great influence in determining the pattern of the present ranges and the nature of yielding under the Laramide compression which produced them. Where the complex crystalline rocks were deeply buried beneath a thick cover of weaker geosynclinal sedimentary strata, the latter were folded with relative regularity in long, linear, nearly parallel ranges which extend through many degrees of latitude. But in the foreland area to the east, where only 10,000–15,000 feet of Paleozoic and Mesozoic strata overlay the basement complex, the structures and rock differences of the latter were sufficiently close to the surface to exert a strong control which upset the regularity of the Rocky Mountain deformation. The result was an uplifting of variously oriented block-like or oblong ranges and a sinking of basins of quite irregular pattern. The basement control was manifested chiefly in two ways. (1) Pre-existing zones of faulting in two cross sets (roughly north-south and east-west) have outlined rectangular areas which deformed each with a certain individuality of its own. In south-central Montana block-like areas were moderately uplifted without much tilting. Differential horizontal movement also occurred, particularly on the east-west lines, the south block in each case shifting east relative to that on the north. To the south, much stronger uplifts developed the Beartooth, Pryor, Bighorn and other mountain groups far east of the Rocky Mountain front in northern Montana and Canada. The crustal adjustment involved in this easterly offsetting was accomplished in part by the differential horizontal shifting. These mountain groups are composed of transverse subunits, some tipped up most on the northeast, others on the southwest, developing a remarkable reversal of asymmetry in alternating segments of the ranges. (2) The Laramide folding of the Beartooth, Bighorn and Black Hills has also accentuated old pre-Cambrian dome-like uplifts with batholithic cores. These outlines, however, are at variance with the block fracturing; but in places the two have combined in a composite basement control. The individuality of the foreland ranges, their divergencies from the general northwest-southeast Rocky Mountain alignment and their particular behavior have resulted from this composite control. The numerous minor folds, involving chiefly the sedimentary cover, have been much less influenced by the basement and follow closely the regional northwest-southeast Rocky Mountain trend.

*Biographical memoir of David Watson Taylor:* WILLIAM HOVGAARD.

# OBITUARY

## ANNIE JUMP CANNON

ON the thirteenth of April, 1941, the world lost a great scientist and a great woman, astronomy lost a distinguished contributor and countless human beings lost a beloved friend by the death of Miss Annie J. Cannon.

Miss Cannon was born in Dover, Delaware, in the year 1863. In days when an education for women is easily come by, it is hard to appreciate the enlightenment of a parent who was willing to further a daughter's "higher education" in the seventies and eighties of last century. Her father gave effect to her early delight in the phenomena of nature, and she entered the class of 1885 at Wellesley. Not long ago she was recalling those early days; one might have expected the girls to be very serious and earnest, she said; but they always seemed to be laughing. And in that spirit she went through life, always endowing what seemed to many people an impossibly laborious and exacting occupation with joy and vitality.

After completing her studies at Wellesley, Miss Cannon came in 1896 to the Harvard Observatory, then under the directorship of Edward C. Pickering; and here for the first time she began those studies of stellar spectra with which her name will always be associated, although they were by no means the sum total of her contribution to science. The study of the spectra of the southern stars, published in 1901 in Volume 28 of the Annals of the Harvard College Observatory, was her first major research. This work is still a treasure-house of information for the student of stellar spectra, but its greatest interest probably lies in the fact that the system of spectral classification that later came into general currency was here crystallized for the first time.

The Henry Draper Catalogue (named in honor of the first man to photograph stellar spectra) was the outcome of the earlier studies of stellar spectra; and when the means were available for the execution of the immense task of classifying the spectra of almost a quarter of a million stars, it was Miss Cannon whom Pickering selected for carrying it out. Of the value of the Henry Draper Catalogue to science it is almost unnecessary to speak; there is not a branch of astronomy or astrophysics that has not drawn upon it, and will not cease to draw upon it for many years to come. But perhaps it is not unbefitting to speak of the labor that was involved in producing so great a work. The classification of the spectra themselves—most of them from more than one photograph—though a great undertaking, was by no means the major part of the work; it was carried out during the space of only

five years. Even greater was the labor of identifying and arranging the entries, and of preparing and issuing the nine volumes of the Harvard Annals that contain the catalogue. Pickering, who found in the Henry Draper Catalogue the culmination of his work as director of the Harvard Observatory, lived to see the publication only of the first three volumes; the completion of the remaining six fell largely upon Miss Cannon. The nine volumes were issued between 1918 and 1924. They are Miss Cannon's greatest legacy to science.

When the ninth volume of the catalogue was issued, Miss Cannon was sixty years old, and many men and women might have felt justified in thinking that their life-work had been completed. But with the astonishing vitality that marked all her actions, she at once embarked on the even more laborious and exacting task of classifying the spectra of yet fainter stars. This work led to the completion of a number of successive sections of the "Henry Draper Extension," less known, perhaps, than the great catalogue, but not less significant, for they contained intensive studies of stellar regions of particular interest. The program that she had undertaken was of heroic proportions, and she worked upon it, without intermission, until a few weeks before her death. In addition to the studies of stellar spectra published at Harvard, Miss Cannon was never too busy to carry out the classification of stars for other investigators, whether it involved looking up a puzzling star for a colleague, or the classification of all accessible stars in the Yale Zone Catalogue or the Cape Zone Catalogue, for publication in those volumes.

Had Miss Cannon never worked in stellar spectroscopy, she would still have put the astronomical world greatly in her debt by her early studies of variable stars. Her first years at the Observatory coincided with the first outburst of the photographic study of stellar variability—a study that has gone far to transform astronomy. The astronomical literature of the first two decades of the present century bears witness to her important contributions to the study of variable stars. She never lost touch with the subject; and her complete catalogue of all papers relating to variable stars, always kept up to date, has been of immeasurable value to her colleagues.

A bibliography of Miss Cannon's scientific work would be exceedingly long, but it would be far easier to compile one than to presume to say how great has been the influence of her researches in astronomy. For there is scarcely a living astronomer who can remember the time when Miss Cannon was not an authoritative figure. It is nearly impossible for us to imagine the astronomical world without her. Of late years she has been not only a vital, living person; she has been an institution. Already in our schooldays she was a legend. The scientific world has lost something besides a great scientist.

During the past twenty years, Miss Cannon was the subject of many academic honors, which she received with genuine and infectious pleasure. Honorary degrees were conferred on her by the University of Delaware, the University of Groningen (Holland), Wellesley College, Oxford University (England), Oglethorpe University and Mount Holyoke College. In 1931 she was awarded the coveted Draper Medal of the National Academy of Sciences, and in 1932, the Ellen Richards research prize.

A life of such distinction could not but be reflected in the furtherance of the education of women. Miss Cannon herself took pleasure in this result, and several younger generations of women scientists have owed much to her kindness, help and encouragement.

As it would be an impertinence to presume to say how great a loss the scientific world has sustained, it would be an impossibility to measure the personal loss that has befallen Miss Cannon's human friends. To them she was not the great scientist; she did not bore them by talking about stellar spectra. She was a human being, and as such they loved her—they, and their children and their grandchildren. Perhaps the greatest tribute that I can pay to her memory is to say that she was the happiest person I have ever known.

CECILIA PAYNE GAPOSCHKIN

## RECENT DEATHS AND MEMORIALS

DR. JOSEPH ELLIS TREVOR, since 1934 professor emeritus of thermodynamics at Cornell University, died on May 4. He was seventy-six years old.

DR. MORTON GITHENS LLOYD, since 1917 principal engineer and chief of the Safety Codes Section of the National Bureau of Standards, died on April 26 at the age of sixty-seven years.

ELIZABETH FLORETTE FISHER, professor of geology and geography at Wellesley College, who until her retirement with the title emeritus in 1926 had been connected with the college for thirty-two years, died on April 25 at the age of sixty-eight years.

DR. FAREL LOUIS JOUARD, otolaryngologist of the New York Ophthalmic Hospital, died on April 27 at the age of fifty-seven years.

DR. HAROLD LYNWOOD WARWICK, practising aurist of Fort Worth, Texas, died on April 28 at the age of sixty-three years.

DR. ARTHUR LAPWORTH, since 1935 emeritus professor of chemistry at the University of Manchester, died on April 5.

DR. JOHN SMYTH MACDONALD, emeritus professor