"Non, ce qu'il cherchait dans le travail, c'était peut-être un peu le plaisir de poursuivre la vérité et de la trouver, mais c'était avant tout le bonheur de travailler; tel un alpiniste qui entreprendrait de longues et pénibles ascensions, non pour contempler de sublimes paysages, mais pour goûter la saine fatigue de la marche."

M. Radau was elected an Associate of the Society on 1905 June 9.

In Mrs. FLEMING the Society loses one of the only five* women who have ever been elected to Honorary membership. Although all her astronomical work was done in the United States, and must be credited without any reservation to the Harvard Observatory, she was by birth a Scotswoman, and did not go to America until after her marriage. Her engrossing work prevented any thought of a return to her native land, even for a holiday, until recently; and the sad news of her death came just when many friends were hoping to see her once more on this side of the Atlantic. There had indeed been some warnings that all was not well: within the last year or two more than one serious operation, which she bore with unflinching courage, had been necessary; but she had recovered so completely that her friends in Boston had no hesitation in urging her to undertake the long journey to California in September 1910 for the meeting of the Union for Solar Research on Mount Wilson. Undoubtedly she was fatigued at times, but went through the whole programme, and had the pleasure of visiting her son (now an engineer at Salt Lake City) on the return journey. On arriving home, she found a few days' rest advisable, but was soon back at work and promptly found two more "new" stars (making her total 10 out of the 17 discovered in the last 25 years). A few months later, however, she became seriously ill, and the end came on May 21 last.

Williamina Paton Fleming was born at Dundee 1857 May 15. We learn from a notice of her life and work prepared by Professor E. C. Pickering that she "belonged to the family of the Claverhouse Grahams, the 'fighting Grahams.' She inherited in a marked degree many of the best characteristics of this distinguished family —energy, perseverance, and loyalty. Her great-great-grandmother lived in the Dower House in Stirling, Scotland, which passed to another branch of the family for lack of male heirs; Captain Walker of the Seventy-ninth Highlanders eloped with and married her daughter. He served under Sir John Moore in the Peninsular

* The others are or were, Caroline Herschel, Mary Somerville, Anne Sheepshanks, Agnes Mary Clerke, and Margaret Lindsay Huggins. The name of Miss Sheepshanks is sometimes overlooked, and it is true that the grounds for her election differ somewhat from those in the other cases. She did no astronomical work herself, but her gifts (of £12,000 in all) have greatly benefited the Cambridge Observatory, providing the transit-circle and the Sheepshanks Telescope with which recent parallax and Eros work was done; besides attracting various mathematicians to Astronomy through the Sheepshanks Astronomical Exhibition. See *Mon. Not.*, xxxvii. p. 143.

War, and, like his leader, was killed at the battle of Corunna. His wife had accompanied him, and gave birth to a son, John Walker, Mrs. Fleming's grandfather, on the same day, and on the field of battle. Captain Walker's son-in-law, Robert Stevens, settled in Dundee, and was one of the first to experiment with photography in that city."

"Mrs. Fleming began work at the Harvard Observatory in 1881. Her duties were at first of the simplest character, copying and ordinary computing. Later, as her powers developed, she was advanced until she occupied one of the most important positions in the Observatory. . . . The work she left unfinished will fill several of the quarto publications of the Observatory. . . . Her principal published work will be found in volumes 13, 18, 26, 27 and 47 of [the Harvard] *Annals*, and in many of the Circulars of the Observatory."

The most casual inspection of these specified volumes fills us with admiration for the amount, the effectiveness, and the novelty of Mrs. Fleming's work. Take, for instance, volumes 26 and 27, which represent the work on the Draper Memorial, resulting in a Catalogue of the photographic spectra of 10,351 stars north of $-25°$. The work was commenced by Miss N. Farrar, but the "greater portion of it, the measurement and classification of all the spectra, and the preparation of the Catalogue for publication, has been in charge of Mrs. Fleming." Eight computers are named as having assisted her at different times, but to work through computers is rather a change of method than a relief from labour; and it was not the least part of Mrs. Fleming's work to have organised a great deal of computing work, and trained others to follow her in the operations requiring judgment. Or take, again, Part 1 of vol. xlvii.: "Mrs. Fleming has selected and measured the positions of a sequence of [comparison stars for studying photographically] each of 222 variables discovered [at Harvard] by her, or under her direction." Many astronomers are deservedly proud to have discovered one variable, and content to leave the arrangements for its observation to others: the discovery of 222, and the care for their future on this scale, is an achievement bordering on the marvellous.

And the same volume gives us an illustration of the effectiveness of this work. "The greater portion of these [variables] has been found from the characteristic spectrum, Md, which indicates the third type traversed by bright hydrogen lines. While many variable stars of long period have spectra of the fourth type, and a few have spectra of the third type in which the hydrogen lines are not bright in the photographs, no case has yet been found in which a star having the spectrum Md, described above, is not variable." Here is a generalisation of obvious significance, gathered in the course of arduous labour. It is only too easy to miss such points when dealing with thousands of observations—to miss "seeing the wood because of the trees"—but the Harvard workers were alert. Another generalisation of great importance was early

seized by them, relating to the distribution of Wolf-Rayet stars in the Milky Way and Magellanic Clouds. It would not be fitting, and it might not be possible, to attempt to separate out the exact share in such advances due to Mrs. Fleming herself; and certainly nothing could be farther from the intentions of the writer than to ignore the influence of the Director of an observatory, and especially of the Harvard Observatory; but Professor Pickering's own generous words about his assistant have paved the way for appreciation without fear of misconception.

The effectiveness and the novelty of Mrs. Fleming's work appear almost more clearly in the Circulars than in the volumes. These Circulars began to appear in October 1895 as a means of making prompt announcement of the results of work; and the first of them deals with Mrs. Fleming's discovery of a New Star in Carina. The second deals with Mr. Bailey's variables in clusters, but the variability had been "confirmed independently by Mrs. Fleming"; and so, in one way or another, as accessory if not as principal, Mrs. Fleming appears explicitly in 17 Circulars out of the first 25. No. 4 relates to another New Star—her fourth, she increased her total ultimately to ten; and in No. 20 we find that, as the result of her examination of many thousand plates, "numerous remarkable objects have been discovered. One of the latest is the spectrum of a meteor which has thus been photographed for the first time." The Circulars, however, do not all contain announcements of discoveries; some of them, for instance, foreshadow plans of work or administration; and the activities of the observatory expanded in new directions. For such reasons the name of Mrs. Fleming afterwards occurs less frequently. But when, for instance, in Circular No. 54 we have "64 new variable stars" announced, all but 11 of them have Mrs. Fleming's name attached; and several Circulars deal with "objects having peculiar spectra" almost all discovered by her. Her catalogues of stars having peculiar spectra are among the unpublished work mentioned above; fortunately they are nearly completed and are partly in type. There is also a catalogue of several thousand stars whose spectra are of the third type: there are "Journals of the variables she discovered, showing the photographic brightness of each on several hundred plates: sequences of stars in 48 standard regions: and classification of about 1500 stars in the same region, forming a catalogue now in type."

As an astronomer Mrs. Fleming was somewhat exceptional in being a woman; and in putting her work alongside that of others, it would be unjust not to remember that she left her heavy daily labours at the observatory to undertake on her return home those household cares of which a man usually expects to be relieved. She was fully equal to the double task, as those who have had the good fortune to be her guests can testify: and it is perhaps worthy of record, as indicating how lightly the double burden sat on her, that she yielded to none in her enjoyment of a football match, especially a match between Harvard and Yale.

She was the only Honorary Fellow of Wellesley College, an active and enthusiastic charter member of the Astronomical and Astrophysical Society of America, and a member of the Société Astronomique de France. Last winter she received the Guadalupe Almendaro gold medal of the Sociedad Astronomica de Mexico. She was elected an Honorary Member of this Society, 1906 May 11. H. H. T.

Proceedings of Observatories.

The following reports of the proceedings of Observatories during the past year have been received from the Directors of the several Observatories, who are alone responsible for the same.

Royal Observatory, Greenwich.
(*Director, Dr. F. W. Dyson, Astronomer Royal.*)

Transit-Circle.—During the year 14,111 observations have been obtained. The Sun was observed 176 times and the Moon 122 times. Reflexion observations of stars were obtained on 86 nights.

The working catalogue of stars contains the fundamental stars observable in this latitude, and all stars down to magnitude 9·0 and a few fainter ones within the limits of Declination 24° to 32° N. (the Oxford Astrographic zone). Work on this catalogue was begun in 1906, so that 6 years out of the 10 originally allotted to it have now elapsed. A very closely proportionate number of observations have so far been obtained, the average number of observations per zone star being 3·0 out of the 5 required. Largely owing to the remarkably fine summer this year, the portion of the catalogue between 16^h and 24^h has been very fully observed; but the portion between 5^h and 10^h is much behind, owing to the cloudy weather last winter and this.

The sidereal standard clock has been removed from the magnetic basement to a new clock-room near the lower computing-room in the old part of the Observatory.

Altazimuth.—During the year 1924 observations of meridian transits have been obtained. The Moon has been observed 90 times on the meridian, and there were 31 extra-meridian observations made during the first and last quarters. The number of reflexion observations of stars is 273.

The Altazimuth Ten-Year Catalogue for the years 1899–1908 is completed, with the exception of the introduction.

The determination of the Moon's parallax made by the Royal Observatories of Greenwich and of the Cape of Good Hope from observations of the crater Mösting A 1906–10, has been published in *Monthly Notices*, vol. lxxi. pp. 526–540.

Reflex Zenith-tube.—A discussion of the observations made during the years 1906–9 showed that there was little hope of this instrument in its present form giving results of the accuracy now required in this work. Accordingly on August 24 the Reflex Zenith-tube was superseded by the Floating Zenith-telescope, and