

marble"; and on the south the black slaty sedimentary rocks contained some veins of iron pyrites with quartz and other igneous rocks.

As in their previous joint books, the text is enriched by a profusion of excellent photographs, all taken by the writers themselves, and quite up to the high standard set in their earlier journals. Altogether, it is an attractive record of solid geographical achievement.

(2) This is one of the travel-books which owe their existence to the enterprise of horticulturists ransacking the world for new species of flowering plants for decorative garden purposes. The recesses of south-western China have already proved a happy hunting-ground for such botanical expeditions, especially in the more southern borders, but our author traversed the unfrequented northern

on the Tibetan border called the White Wolves. He prefers his own system of phonetics for Chinese names: thus Archueh becomes "Arjeri," and the familiar Yamen appears as "Yamun."

With Mr. Purdom, formerly of Kew, and three Chinese lads, Mr. Farrer started from Peking in the spring of 1914 and spent that year on the hill ranges of South Kansu on the border of Tibet, and thereafter wintered in the north, moving farther north in 1915 into the alpine tracts above Sining. Those tracts had previously been in part traversed rapidly by the scientific expeditions of Prezewalsky and Potanin, but these brought back only dried specimens, and did not gather seeds or living plants, which defect our author has now remedied for cultural purposes in regard to several rare species. A list of the new species is given



FIG. 1.—*Isopyrum Farreri*, sp.n. From "On the Eaves of the World"

portion in the hope of securing new specimens which would be more hardy and thus more suitable for the British climate than the softer productions of Yunnan and Szechuan, which have now been freely explored by Forrest and other collectors. The narrative, in detailing the author's experiences, reflects his abounding enthusiasm; and though he has his eyes mainly on the business of collecting, he also gives incidentally a good deal of description of the people and of the country through which he passes. As it makes no pretence of being a scientific book, and is thoroughly colloquial in style, relatively free from technicalities except the names of plants, and somewhat facetious, it is easy reading for the general reader. The author had some excitement at times in evading the roving bands of brigands

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in the appendix, and includes amongst others several new poppies, primulas, and asters, a new gentian, and two new rhododendrons, besides the *Isopyrum* named after the author, which is here illustrated. Several others of the new species are also decidedly decorative, as seen in good photographic reproductions, whilst other photographs illustrate some of the country traversed and its semi-Tibetan people.

L. A. WADDELL.

#### THE SUN AND THE WEATHER.

PROF. C. G. ABBOT has contributed to the *Scientific Monthly* (November, 1917) a reasoned discussion, in the light of recent investigations, of the extent and probable sequence of the effect of solar variation on world weather.

More than one independent line of argument will be found to point to the conclusion that in a period of two thousand years there has been no appreciable change of climate. Therefore the balance of the heat exchanges between the earth's income from the solar radiation and its expenditure in terrestrial radiation into space may be regarded as only fluctuating between narrow limits. Eighty per cent. of the solar radiation fails to reach the earth's surface through its protecting envelopes, and 90 per cent. of the terrestrial radiation fails to escape. Such is the beneficent effect of our atmosphere, for want of which the temperature of the moon's surface, as proved by actual observation, falls during the short period of a lunar eclipse many times as far as does that of any part of the earth between day and night. In most places on the earth the surface air temperature rarely varies as much as 1 per cent. from day to day, but the variation between day and night is affected by the character of the surface, Timbuktu, in the Sahara desert, having twice the daily and four times the annual change of temperature at Port au Prince, Haiti, in approximately the same latitude.

Prof. Abbot considers that a slow increase of 1 per cent. in solar radiation should produce a change of 1 per cent. in terrestrial radiation, and on the assumption that this varies as the fourth power of the absolute temperature, he finds this to be equivalent to a change of  $0.7^{\circ}$  C. for each unit per cent. of change of the solar radiation. The annual change of mean temperature at Timbuktu on this account should be  $24^{\circ}$  C., but is actually only  $13.6^{\circ}$  C. From this Prof. Abbot concludes that the annual variation (due to the sun's changing altitude) is not slow enough to produce its full effect, and suggests that the variation in the period of the sun-spot cycle may be more effective.

Dr. G. T. Walker finds in general a lower temperature at sun-spot maximum, and this is confirmed numerically. Köppen, for instance, finds at sun-spot maximum an average decrease of  $0.7^{\circ}$  C. for the period 1815-73, and of  $0.5^{\circ}$  C. for the period 1873-1910, when the maxima were, on the average, less intense. This apparent paradox is tentatively attributed to increased cloudiness, possibly due to greater penetrative power of the solar ions. Prof. Abbot's short-period fluctuations in the solar radiation provide another line of approach to the elucidation of the problem, and Dr. Clayton, of Argentina, has applied the method of correlation, for about fifty well-distributed stations, between Mount Wilson solar constant values and local changes of temperature for the few following days, obtaining in some cases significant coefficients. Thus an increase of solar radiation was followed by an increase of temperature at Pilar, Argentina, with its maximum one or two days late, and by a decrease at San Diego, California, with its maximum three or four days late. In the temperate zones, roughly speaking, the correlation is negative, and elsewhere positive,

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but the tropical belt of positive correlation is narrower over the oceans. The amount of the change found by Dr. Clayton is several times larger than Prof. Abbot's reasoning led him to expect. He therefore concludes that the results require confirmation, but that they indicate secondary processes set going in the atmosphere by changes in solar radiation, and that the effect on winds, cloudiness, and precipitation may be revealed. He infers that as the changes in the sun are followed by changes of similar magnitude on the earth, with a lag depending on latitude, these changes could be predicted if we can secure daily observation of the solar emission. For this purpose new observing stations in cloudless regions are required, and considerations of expense will probably defer this until after the war. Prof. Abbot hints finally that a bequest of half a million dollars would enable the Smithsonian Institution to handle the problem adequately.

W. W. B.

#### ANTI-VIVISECTIONISTS AND PROTECTIVE MEDICINE IN THE ARMY.

IT is wonderful to what follies anti-vivisection will betray those who believe in it. The American Red Cross has been involved in a lawsuit by some of the American anti-vivisectionists, who are endeavouring to prevent it from doing medical research on active service. This research would be, almost all of it, bacteriological; it would be inoculations of small rodents in the direct course of the work of the Red Cross for the Army; but the anti-vivisectionists seem to care more for the rodents than for the Army. Dr. W. W. Keen, of Philadelphia, one of the very foremost of American surgeons, whose name is well known among our own physicians and surgeons, has written an admirable article in *Science* of February 22 last on this attempt to interfere with the work of the Red Cross. He tells again some of the oft-told truths: the facts of the protective treatment against typhoid, of the protective treatment against tetanus, of the results of Lister's work, and so forth. He points out that the anti-vivisectionists in his country all these many years have done nothing, absolutely nothing, to lessen disease or to save life either in animals or in man; and he quotes the statement made by forty-one American medical officers on active service in France: "We feel that anyone endeavouring to stop the Red Cross from assisting in its humanitarian and humane desire to prevent American soldiers from being diseased, and protecting them by solving the peculiar new problems of disease with which the Army is confronted, is in reality giving aid and comfort to the enemy."

This article by Dr. Keen is well worth studying; but some anti-vivisectionists are blind and cruel; and it is not possible to reason with them, any more than Antonio could argue with Shylock. The fact is that the anti-vivisectionists, since the War, have been rather out of work; and, as Dr. Watts says, "Satan finds some mischief still for idle hands to do."

Over here they have done, since 1914, very