LETTERS TO THE EDITOR.

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End-Products of Thorium.

MR. J. R. COTTER's letter on this subject (NATURE, January 30), stating that he has been unable to detect the presence of thallium in thorianite, and is confident that it does not contain even 0·005 per cent., is in accord with other evidence of which I have been given private information. I may say, however, that the actual amount of thallium I separated from 20 kilograms of thorite was very small, certainly less than 0·005 per cent., though no particular precautions were taken to effect a quantitative separation, as its presence was only detected during the working up of the whole quantity for lead. Prof. Joly has pointed out (NATURE, June 7, 1917) that the hypothesis of the instability of the major end-product of thorium involves the explanation of the disappearance from the 20 kilograms of mineral of 150 grams of unstable lead, whereas the structure of the thorium halo gives no support to the view that unknown α-ray changes occur in the thorium series.

Not only against the particular suggestion as regards thallium, but also on the general one that one of the end-products of thorium is unstable, the evidence appears now to be against the view. I have no new observations to offer, but Mr. Lawson, writing to me recently from the Radium Institut, Vienna, refers to researches carried out there by Prof. Meyer and others, from which the conclusion has been drawn that both the isotopes of thorio-lead appear to be stable. Referring to elements which an unstable lead could conceivably produce, he mentions my observation of the presence of appreciable quantities of iodine in thorite and the possibility that this may be "eka-iodine" of atomic number 85. I may say that this point was thoroughly investigated four years ago by Mr. J. A. Cranston, who determined its atomic weight, and found it to be that of ordinary iodine.

FREDERICK SODDY.

The Neglect of Biological Subjects in Education.

PROF. BOYCOTT's letter on this subject in NATURE of January 23 deserves the serious attention of those who are striving to secure, as an element in our higher education, some sound knowledge of elementary science and of true scientific method of thought. Quite apart from the important and useful information which would be incidentally acquired from well-directed biological teaching, the student would thus receive an excellent schooling in how to think clearly. It is constantly forgotten that an immense proportion of the subject-matters which concern human beings in their everyday life are on the "biological" side of the border-line which conventionally divides them from the domain of "physics."

It has frequently been shown how ignorant many men in very high places are of the elements of chemistry and physics. To illustrate such lack of knowledge of simple biology would be a very easy task. But the value of some really sound instruction in biology, even only as a mental training, should be widely recognised.

H. BRYAN DONKIN.

London, January 30.

Scientific and Practical Metric Units.

IN the article entitled "Scientific and Practical Metric Units" which appeared in NATURE of October 24, 1918, reference is made to the convenient bridge to the metric system which exists in the ton, and the author asks for a convenient monosyllabic name for a weight of about 2·2 lb. I would commend for consideration the word "seer." The Imperial Indian seer, in common use all over India on the railways, weighs 2·05 lb., and would be as convenient a bridge to the metric system for India as the ton would be at home.

In many parts of Madras the local measuring seer for grain weighs a little more than 2 lb.

G. R. HILSON,
Deputy Director of Agriculture.

Bellary, Madras, S. India.
December 7, 1918.

THE ECLIPSE OF THE SUN ON MAY 29.

IT has been found impossible to organise any British solar eclipse expeditions since those sent to Sweden and Russia in the summer of 1914, just before the threat of war arose. Consequently, advantage is being taken of the cessation of hostilities to arrange for the occupation of two stations in the eclipse of next May by parties sent out by the Joint Permanent Eclipse Committee of the Royal and Royal Astronomical Societies. This eclipse is noteworthy for the long duration of totality, which is 6m. 50s. in mid-Atlantic, and 5m. 13s. at each of the selected stations. The duration of totality in the eclipses of the same series in the Saros cycle has been gradually increasing, and will reach a maximum of about 7m. 8s. in June, 1955, in the neighbourhood of Manila; this duration will exceed that of any eclipse in the preceding millennium.

The track of totality next May crosses the entire breadth of South America and Africa. For stations of tolerable accessibility and sufficiently high sun, our choice is restricted to north-eastern Brazil and equatorial West Africa. There is a rather serious error in the maps of the eclipse printed in the ephemerides; they indicate the track of totality as lying to the south of the Liberian coast, but totality will, in fact, be observable on that coast, and the duration of totality and height of sun are greater than at any other land station. However, the weather prospects are not favourable, and it is not proposed to occupy a station there. The selected Brazilian station is Sobral, in Ceara, about 80 miles inland, connected by railway with Camocim, which is reached by steamer from Para. Messrs. Crommelin and Davidson, of the Royal Observatory, Greenwich, are going there, while Prof. Eddington and Mr. Cottingham will occupy the Portuguese island of Principe, 110 miles distant from the African coast, which is reached by fortnightly steamer from Lisbon.

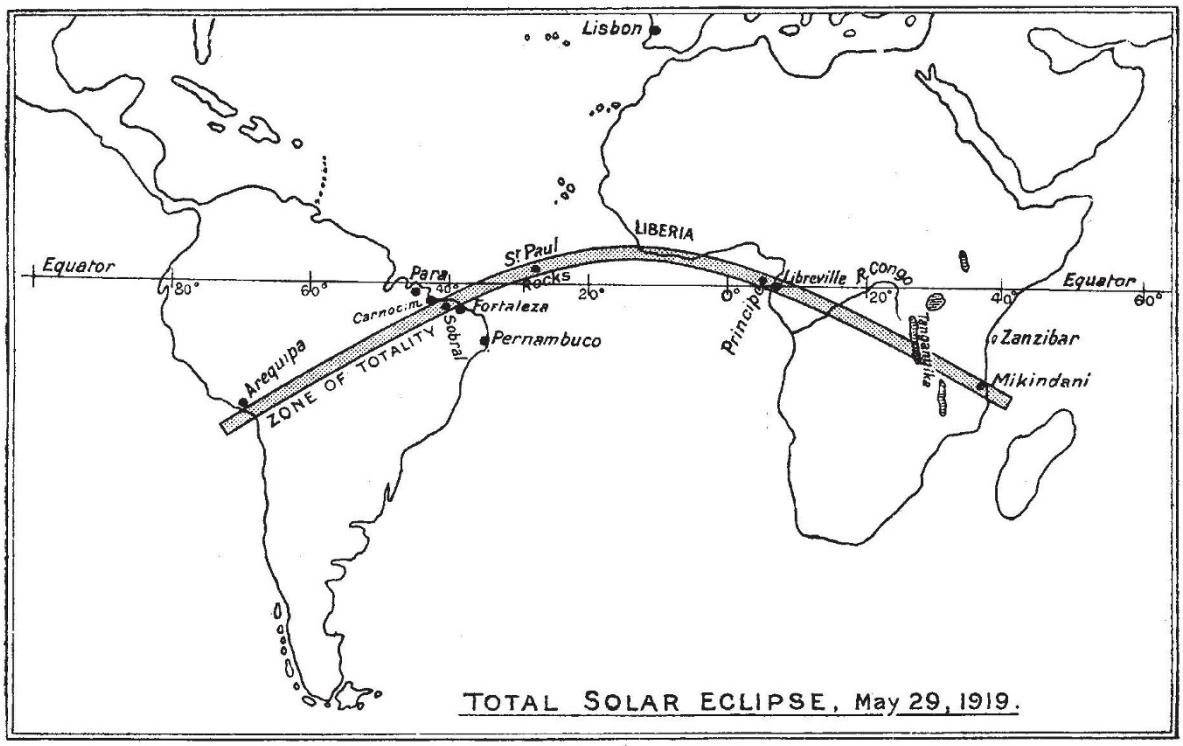
Other possible stations are the African coast, near Libreville, or the high ground to the west of Lake Tanganyika. The weather prospects at the latter place are the best along the track of

totality, but the sun's altitude is only about 15°, and the journey is difficult.

There is no information to hand at present as to expeditions from other countries. American astronomers have taken a prominent part in the observation of recent eclipses, but, apparently, they are satisfied with their successful observations in their own country last June, and do not contemplate making observations next May; it is hoped, however, that the South American observatories may take part.

Besides the long totality, this eclipse is also noteworthy for the rich field of stars round the sun; the Astronomer Royal gave a diagram of their configuration in the Monthly Notices for March, 1917, and directed attention to the very favourable opportunity that would be presented for testing Einstein's theory of relativity, according to which a ray tangential to the sun from a star would be deflected through 1·74″, the deflection for other stars being inversely proportional to their angular distance from the sun's centre. Prof. Eddington has directed attention to the deduction that, since a ray of light carries energy, even apart from Einstein's theory, we should expect the same shift as would be produced by the sun's gravitation on a particle passing close to its surface with the speed of light; it is easy to show that this shift would be exactly half that predicted by Einstein, or 0·87″ at the sun's limb. There are thus three possibilities: no shift, the half shift, or the full Einstein shift. The definite establishment of any one of the three as the truth would be an important addition to our knowledge of physics. Should the decision be in favour of the Einstein shift, it would, in combination with the success of the latter in explaining the motion of the perihelion of Mercury, suffice to lead to its acceptance as the actual system of the universe. Its definite disproof would also be of service, since it would avoid the dissipation of further energy in its elaboration, though it would still deserve our admiration as an ingenious system of ideal geometry.

Consequently, the British observers will leave questions of solar or coronal physics altogether alone on this occasion, and will concentrate on the effort to obtain accurate photographs of the star-field round the sun for comparison with photographs that have already been obtained of the same region in the night sky. There are thirteen stars in the region down to magnitude 7·0 within the field of an astrographic plate, which is a square slightly more than 2° in the side; nine of them are as bright as or brighter than 6·0 mag. It is not proposed to give exposures exceeding 10s., and it is hoped that, with restrained development, all the thirteen stars may be recorded without being overpowered by the diffused light of the corona. The object-glasses of the Greenwich and Oxford astrographic equatorials will both be employed, also some smaller lenses of longer focus. The driving clocks of the cœlostats have given some trouble in former eclipses, but they have been carefully overhauled by Mr. Cottingham, and a notable improvement is expected. In any case, exposures limited to 10s. do not require very accurate driving.



TOTAL SOLAR ECLIPSE, May 29, 1919.

The interval of time between totality at the two stations is 2h. 19m., during which the sun will move nearly 6′. Hence the shifts of the nearer stars should be sensibly altered in the interval, giving a further opportunity for verification.

Some photographs were taken for the same purpose in the United States last June, but the publication of results has been postponed until the same region has been photographed in the night sky. The region was much poorer in bright stars than that of next May.

The expeditions propose to leave Liverpool by the Booth line about the middle of March, travelling in company so far as Lisbon, where the Principe party will tranship. It is desired to reach the observing stations three or four weeks in advance of the eclipse.

A. C. D. CROMMELIN.

AMERICA AND GERMAN SCIENCE.

WE have already, on more than one occasion, directed attention to the effect exerted by the war on American opinion concerning German science and on the marked change it has brought about in the attitude of American men of science towards their German *confrères*. The change is the more remarkable in that it is contrary to what might have been anticipated from the leaven of Teutonism which exists in the United States, and from the possible influence of German university-trained men on American education and on American technology. It is well known that the German Government confidently counted upon this element to restrain America from participating in the world-wide struggle upon which it had embarked. As usual, it miscalculated. The "hyphenated" American, who had thrown in his lot with his adopted country, and learned to know and to appreciate its institutions and its ideals, had, with comparatively few exceptions, no real sympathy with Germany's unscrupulous designs to dominate the world and to impose its "Kultur" upon mankind. Where it was well with him, there was his country. Of course, there were traitors, for the most part controlled and instigated from Berlin, but, looking back upon the past, it is remarkable how small their influence was in modifying American opinion, or in thwarting American action.

Public opinion, indeed, thoroughly supported the American Government in its prompt and energetic dealing with covert attempts to undermine the loyalty of American citizens, or with overt acts to injure or terrorise them by outrage and crime. Such attempts, so far from achieving their object, had precisely the opposite effect. An act of outrage and terrorism like the destruction of the *Lusitania*, with its awful loss of life, did more to rouse and stiffen American feeling than any single measure that could have been conceived. As Fouché said, it was more than a crime; it was a political fault, and that of the most egregious kind. The extravagant jubilation with which the crime was everywhere hailed in Germany was the finishing touch to the episode, and greatly intensified the wrathful indignation and disgust of civilised humanity. It was significant that the American troops should go into action with the battle-cry of "*Lusitania!*" and that intellectual and cultured America should visit its resentment upon those of its own class in Germany, who, so far from protesting against this affront to our common humanity, shared the general joy of their countrymen that it had been committed.

Recent attempts to dissect the mentality of German men of science have accentuated this feeling. They and their works have been put through a scrupulous assay, with the result that they are no longer taken at their own valuation. The scales have fallen from people's eyes. In various papers and articles which have appeared in American scientific periodicals we have been given the results of the analysis, and, to say the least, they are not flattering to German self-esteem. Dr. Nutting, in a recent issue of *Science*, describes the methods, "some of them entirely legitimate by every standard, others entirely indefensible by any standard," by which Germany has sought to establish her prestige in pure and applied science. Whilst America in the past respected Germany's diligent productive workers, and contributed, with some qualms of conscience, rather freely to German scientific literature, she smiled at her many false claims to superiority and originality, and generally despised her technologists for their piratical methods. With the coming of the war she was surprised to find how well she got along without her, and how little she was really indebted to her. Whilst it is true that the scientific and technical output of Germany was greater in proportion to population than in any other country, it is not true that scientific ability or originality is higher in native-born Teutons than among other civilised races. This, indeed, has been admitted by such an authority as Prof. Emil Fischer, who, in an address before the German Emperor four years before the war, had the courage to point out to him the shortcomings of the Teutonic mind in originality and creative power. How, then, has Germany gained the prestige she has undoubtedly enjoyed? Dr. Nutting attributes it to what he styles "the intensive factor of publicity"—in other words, to intensive self-advertisement, conscious or unconscious. And he proceeds to indicate in what this has consisted.

It must be admitted that the Teuton mind has the faculty of application—more, perhaps, than that of any other nationality. "A specific problem occupies it to the exclusion of almost everything else. While we [Americans] are prone to work a few hours, then turn to something else, or run off to play, the Teuton eats and sleeps with his problem, takes little interest in anything else, talks shop with his colleagues, and does not completely relax even in his limited recreation."

Our author claims that his compatriots are as ready as any to attack difficult scientific problems,