

LETTERS TO THE EDITOR.

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The East and West Asymmetry of Solar Prominences.

It has attracted the attention of astronomers for some time that solar prominences appear to be more numerous on the east, or advancing, side of the sun than on the west, or receding, side, and systematic observations have been instituted to test this unexpected result. The current Kodaikanal Bulletin (lvii., August, 1917) seems to establish it definitely by a very complete analysis of the observations for the first half of 1917. Of prominences projected on the solar disc as absorption markings, 52.9 per cent. as regards area, and 53.4 per cent. as regards number, were on the eastern side of the central meridian. Of reversals and displacements (largely preponderant towards the red) of hydrogen lines on the disc, there was a like excess on the eastern side. But of the bright prominences directly observed on the limb there was no excess as regards number, and only a slight excess as regards area.

The solar disturbances must presumably be uniformly distributed all round the sun's equator; it would seem to be extremely unlikely, as is generally recognised, that the side which happens to be presented to the earth or any other planet should exhibit special features. But it has doubtless not been overlooked that a more probable mode of explanation is open. Although the character of the prominences can scarcely be affected by any influence of the earth, yet their appearance may be considerably affected by their own configuration with respect to the line of sight of the observer. The outer regions of the solar atmosphere are rotating more rapidly than the parts below; if then a prominence pushed up from below into the atmosphere sloped forwards in the direction of the sun's rotation instead of being on the average perpendicular to the surface, it would present a different aspect and different depth in the line of sight to the observer, according as it is on the advancing or receding side of the sun. The darkness of the absorption markings on the disc would depend on the depth of material through which the light had to penetrate to the observer, and perhaps also in consequence the number of shadings that would be counted as markings would be affected. The amount and direction of this influence it may be hazardous to guess at, but it might just be possible to detect some slight difference in the general appearance of the markings east and west. To the bright prominences on the limb these considerations would apply in a smaller degree, if at all.

J. L.

Cambridge, January 26.

Carnotite Ores and the Supply of Radium.

IN NATURE for October 25, 1917, there appeared a review of Dr. P. E. Browning's book, "Introduction to the Rarer Elements." A special chapter devoted to the radio-elements was contributed by me, and in commenting on this section the reviewer takes exception to a statement that "the chief source of radium has been the minerals containing a higher proportion of uranium, principally carnotite, and the present supply has been largely obtained from the carnotite ores of south-western Colorado." Since the comments of the reviewer suggest the possibility of an even more widespread misconception of the true conditions, I am

taking the liberty of mentioning some of the facts upon which the above statement is based.

The minerals containing a higher proportion of uranium are the several varieties of uraninite (including pitchblende, cleveite, thorianite, etc.), autunite, carnotite, gummite, uranophane, and a number of others which occur only in comparatively small quantities. The ores of uranium from which the supply of radium in commerce has been obtained consist of mixtures of relatively small proportions of these minerals with large proportions of valueless mineral matter, chiefly silica. Thus in the carnotite ores from Colorado the uranium mineral constituent is carnotite containing sometimes as much as 55 per cent. of uranium, while the actual content of uranium in the ore is in most cases scarcely more than 2 per cent. Carefully selected specimens of pitchblende from St. Joachimsthal may occasionally run as high as 70 per cent. uranium, but the ores from this mine, even after concentration, seldom contain more than about 10 per cent. of uranium. Although no trustworthy information on this topic has ever, to my knowledge, been made public, I am strongly inclined to the opinion that the average Cornwall ores (containing pitchblende as the chief uranium mineral constituent) seldom contain more than 5 per cent. of uranium, and I have direct knowledge that some shipments from this locality have fallen considerably below this figure. Other examples might be given, but the above will suffice to justify the statement that "the chief source of radium has been the minerals containing a higher proportion of uranium." It is clear that the uranium content of the ore is seldom indicative of the proportion of uranium contained in the uranium mineral which carries the radium.

In regard to the proportion of the world's supply of radium salts contributed by the Colorado carnotite ores, I may perhaps state that the greater proportion of the radium salts furnished during the years 1903-12 by the De Haen Company, of Hanover, and the Brunswick Quinine Factory was extracted from these ores. The chief source of the radium prepared by the Armet de Lisle and other French factories has been the Colorado ores, and large shipments have also been made to Great Britain from this country. The National Radium Institute and the Standard Chemical Company have separated relatively large amounts of radium salts from the Colorado carnotite ores exclusively. It has been conservatively estimated by those familiar with the subject that prior to 1913 at least one-half of the world's supply of radium salts had been extracted from Colorado carnotite, and the proportion supplied by the Colorado ores since that year has been very much larger. Additional information can be obtained by those who desire it from the publications of the U.S. Bureau of Mines (not Bureau of Standards), the special papers of Dr. C. L. Parsons, chief of the Division of Mineral Technology, U.S. Bureau of Mines, and the records of the "Hearing on Radium" before the U.S. Senate and House of Representatives (Public Documents, S. 4405, and H. J. Res. 185 and 186).

BERTRAM B. BOLTWOOD.

Yale University, New Haven, Conn., U.S.A.,
November 30.

I AM afraid that Prof. Boltwood does not quite see the reason why I hesitated to endorse the statement in question: it was necessary to quote the whole paragraph as it appears in the article, but my difficulty was confined to the words "principally carnotite." It is, of course, obvious that the chief source of radium is the minerals containing a higher percentage of uranium, and it was for that reason only that I hesi-

tated to place carnotite, which at most carries 60 per cent. of uranium, before the pure uranium mineral pitchblende, of which considerable deposits are known to exist both at St. Joachimsthal and in Cornwall, as well as in other countries.

Doubtless the bulk of the present supply of radium has been won from Colorado carnotite ores, but the discovery of radium, all the pioneer work on its separation, and the whole of our first supplies of the salts came from pitchblende. When the present abnormal conditions due to the war have passed, work upon uraninite, both in Bohemia and Cornwall, now practically suspended, will probably become considerable.

J. H. GARDINER.

The Growth of Conifers.

My friend, Mr. D. M. Andrews, has communicated to me an observation which seems to deserve comment. At the Government nursery near Monument, Colorado, at an altitude of 7000 ft., there are two beds of two-year-old seedlings of Engelmann spruce (*Picea Engelmanni*), a common tree of the Rocky Mountains. Each lot is shown to be hardy in the locality, having passed a winter in the open, protected only by a covering of oak branches. The seedlings in one bed, raised from seed gathered in the Pike's Peak, Colorado, region, were, when examined, about 2½ in. high, and had matured their buds and ceased growing for the year in the latter part of August. The seedlings in the other bed, from Arizona seed planted at the same time, were about 4 in. high, and had not yet completed their growth for the year. The Arizona seedlings were green, those from Colorado strongly bluish. Seeking an explanation for this difference, it appears probable that the Colorado trees became adapted to a more severe climate during the waning of the last glacial period, and have not yet lost the physiological characters appropriate to past conditions. The Arizona trees, the ancestors of which lived in a milder, more southern region, did not develop such adaptations, and now that our climate has changed they are actually better fitted for Colorado conditions than trees of Colorado ancestry.

T. D. A. COCKERELL.

University of Colorado, Boulder, Colorado,
December 29, 1917.

THE OUTLOOK IN FRENCH AGRICULTURE.

THE *Revue Scientifique* for September 22 contains a report on the position and prospects of French agriculture presented by M. Louis Mangin, of the Académie des Sciences, to the National Council of the Ligue Française on behalf of the Committee on Economic Organisation of that body. The position revealed is far from reassuring. Wheat production has fallen to barely 70 per cent. of the pre-war crop, potatoes to 80 per cent., wine to 65 per cent., and sugar-beet to little more than 30 per cent. The situation as regards live stock shows the same disquieting features. Practically 20 per cent. of the pre-war head of cattle fell into the hands of the enemy, and ill-devised measures taken to secure the meat supply in the early days of the war further seriously accentuated the shrinkage. Although the cattle position from the point of view of numbers has since been substantially improved, the proportion of young stock is so

great that substantial relief of the meat stringency cannot be expected from home resources for a considerable time. The decline in numbers of sheep which had set in long before the war has been greatly accentuated. Pigs also show a decline of 38 per cent. since the end of 1913. No reference is made to the position as regards milk production. A survey of the forest area completes the tale of depleted resources, something like one-eighth of this area having been already denuded, with but little provision for its replacement.

Many suggestions are put forward for the relief of the present situation and for the future restoration and strengthening of French agriculture. The claims of rice as a diluent of wheaten flour are strongly urged in view of the large supplies available in the Asiatic colonies. To overcome the difficulties of shortage of manual labour on the land, the organisation of supplies of African and yellow labour is suggested, whilst further relief could be obtained by a more active policy with reference to the production and use of motor tractors and farm machinery in general. The example of England in placing this manufacture under the same control as that of munitions of war is warmly commended. Consolidation of estates is urgently necessary and should be accompanied by a revision of the register of lands. The price of corn should be left sufficiently free to rise to encourage production, whilst at the same time the rise in the price of bread should be restricted by all appropriate means. It is suggested that these two apparently irreconcilable objects can be effectively attained through the establishment of municipal bread bureaux, which should subsidise or tax the bakers according to the fluctuations in the price of corn. This expedient was successfully resorted to during the Crimean War.

It is urged that the home production of manures should be fostered by using every measure to increase the output of sulphate of ammonia, by developing the synthetic manufacture of nitrates and ammonia from the atmosphere, and by increasing the production of superphosphate, all of which industries, it is urged, should have the same privileges as munition factories. To secure increased crops arrangements should be made for free distribution of manures to small cultivators.

Measures must be taken for restoring the head of live stock. To this end restrictions must be placed upon slaughter of home stock; the colonial resources of Madagascar and Africa must be drawn upon for meat, to be prepared there in frozen or otherwise preserved condition in order to reduce costs of transport. For the same reason abattoirs and refrigerating plants should be established in the home meat-producing districts, whereby cheaper production and reduction in the number of middlemen would be secured. The strong prejudice of the people against refrigerated or preserved meat must be broken down, and much could be done in this direction by the use of such products throughout the Army and Navy.