

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).

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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-