

the surfaces of the internal fracture within the plate.

Fig. 2 is a side view, and Fig. 3 an oblique view, of the internal fracture seen through the edge of the plate, the lower half of each picture being the image of the upper half formed by the reflection of light at the interior surface of the plate. The circular area of contact from the margin of which the fracture starts appears in Fig. 3 as an elliptic white disc at the centre. It seems clear that the internal fracture practically occurs along the surface of maximum shearing stress set up during the impact.

C. V. RAMAN.

210 Bowbazaar Street, Calcutta, August 18.

The Rigidity of the Earth.

AN account of an experiment to determine the rigidity of the earth was published in the *Astrophysical Journal* and in the *Journal of Geology*, March, 1914. This gave the ratios of the amplitudes of tides observed in N-S and E-W pipes to the amplitudes computed for the same pipes on the assumption of a perfectly rigid earth as 0.523 and 0.710 respectively.

The work of reducing a new set of automatically recorded observations made by an interference method, which was interrupted by the war, was recently resumed, and it was found that the N-S and E-W ratios were very nearly equal to each other.

It was then noted that $0.523/0.710 = 0.7366$, and that the cosine of the latitude of Yerkes Observatory, where the experiment was performed, is 0.7363. It seemed highly probable, therefore, that $\cos \phi$ had been introduced erroneously into the computed formula for N-S tides.

We have just been informed by Prof. Moulton that he has gone over the old formulæ used, and has found that the computer introduced the factor $\cos \phi$ erroneously into the N-S computation.

The N-S ratio should therefore have been $0.523/0.7363 = 0.710$, which, oddly enough, is exactly equal to the E-W ratio.

The new observations point to a value of about 0.69 for both E-W and N-S ratios.

A. A. MICHELSON.

HENRY G. GALE.

University of Chicago, September 10.

The "Flying Gallop" in Art.

IN NATURE of August 21 (p. 489) reference is made to a popular article by Mr. C. W. Bishop on "The Chinese Horse," and to the distribution of the artistic motive of the flying gallop dealt with in it. It may be of interest to remark that this problem was first studied and discussed by the famous French archaeologist S. Reinach in his "La représentation du galop dans l'art ancien et moderne" (Paris, 1901), and was afterwards expanded by me in my book, "Chinese Pottery of the Han Dynasty" (Leyden, 1909), where also many illustrations of the motive from Chinese art-works are given.

B. LAUFER,

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Field Museum, Chicago, September 10.

MUSEUMS, EDUCATION, AND THE BOARD.

FOR many years a number of our provincial museums have striven to make their collections of educational value, both to the ordinary citizen through their exhibits and guides, and to the schools through their exhibits and special circulating collections, as well as by talks to the teachers or pupils. The response of the educa-

tion authorities long continued disappointing, but some eight or ten years ago things began to move more rapidly. Certain pure educationists began to see that there was something of value for them in the museums, and in 1913 the Educational Science Section of the British Association appointed a strong committee to report on the question. The war, though unfortunately preventing the publication of that committee's lengthy report, and hindering museum activities in many directions, has had the result in some towns, notably Manchester, of inducing the schools to lighten their own troubles by seeking the aid of the museums and their staffs.

So well had the movement progressed, thanks mainly to the insistent propaganda of museum officials, individually and through the Museums Association, that at last the Education Act of 1918 and the draft suggestions for the arrangement of schemes thereunder (Circular 1096) took museums into serious account as an educational factor. Museum enthusiasts were delighted. But now comes a move which gives them pause. The Adult Education Committee of the Ministry of Reconstruction has issued an interim report (Cd. 9237) recommending that public libraries and museums should be placed under the control of the local education authorities, and administered by special committees of those bodies, and urging "that the powers and duties of the Local Government Board regarding public libraries and museums should be transferred forthwith to the Board of Education." So reasonable a recommendation would, it is doubtless expected, be welcomed effusively by the institutions concerned. The contrary is the case. The protests of the librarians are quoted—and dismissed—in the interim report itself. They have just been repeated at the meeting of the Library Association in Southport, but we cannot consider them here. As already reported (NATURE, July 17, 1919, p. 394), the Oxford meeting of the Museums Association raised so many objections that it appointed a committee to prepare a statement. And now, in a discussion of the Educational Science Section of the British Association, the opposition of the museums found vigorous expression, and such support as the proposal received from one or two curators was only half-hearted. It may be well, therefore, to summarise the arguments.

The Adult Education Committee holds its opinion so strongly that it has condescended to very little argument. We gather more from a paper laid before Section L by Prof. J. A. Green. This assumes that museums are "fundamentally educational in character," and infers that they should form part of the educational machinery of the country. This machinery should be controlled by one authority, and its parts adapted to a common aim. This would change the outlook of the museums and lead them to display their collections in such a way as to dispel "museum headache." The responsibilities of the Education Committees have been extended to adult education, and they would be better able to bring museums

into touch with universities and other of the higher educational establishments. Where a museum does not exist already, as in certain towns and in country districts, a live education authority would set one up, so that the number will be increased. Museums suffer from want of funds because few are supported by more than a $\frac{1}{2}d.$ rate, some not even by that; they would receive grants in aid directly from the Board of Education.

To this the museums reply that they recognise the argumentative force of a pecuniary bribe; but if their work is worthy of this reward, why should it not be given? For the rest, they dispute the premisses. A museum is *not* fundamentally an educational institution. It exists primarily for the collection and preservation of the works of nature or of man, and its highest aim is the advancement of science or of art. The needs of the researcher must never be sacrificed to those of the elementary student or the public. Even the smallest local museum has a duty in this direction, and it is this spirit which keeps the museum alive. Museums which themselves chart the unknown seas of knowledge can best pilot the learners. Organised education is the vehicle of established knowledge, is necessarily limited in scope, and must move on the rigid lines of a syllabus; but the museum must respond to new influences, must extend knowledge, and assemble material for future research. The existing museum committees are not ideal, but neither are the education committees. The curator knows his men, has been moulding their ideas, and has generally found a chairman with large views. He does not wish to see either himself or his chairman controlled by a body the scope of which embraces but a subsidiary part of his museum's activities. If his means of support are to come solely through educational channels, results will be expected through those channels alone. The others will gradually be blocked, the level of aspiration and accomplishment will be lowered, the living water will stagnate. Museum officials, from experience or observation, distrust bureaucratic government; they want men whom they can approach, not an anonymous Board.

Compromise, however, may be possible. Cooperation is desired, though not subordination. Let the education authority advise upon the public exhibition series, and support financially the educational work of the museum in proportion as it approves. But hands off the unseen activities of the museum! Provincial museums may be linked up with one another and with the national museums above and the minor museums below, but the linking should be through a body representative of their own committees and curators. If the source of money must be the Board of Education, so be it; but let it flow to these committees through a separate museum department of the Board. Museums here, as in the United States, have shown what good educational work they can do on their own initiative. Recognise that initiative, and they will respond with more abundant and more fruitful efforts.

NO. 2606, VOL. 104.]

THE COALFIELDS OF SPITSBERGEN.

COAL is not a new discovery in Spitsbergen. It has been known for more than 300 years, and about a century ago small cargoes were even brought to Norway. But mining on a serious scale did not begin until some fifteen years ago, while its rapid extension is due to the high price and comparative scarcity of coal during and after the war. There are now at least four mines in Spitsbergen exporting coal in large quantities during the summer months, and several others which will soon reach the export stage.

Coal of at least three ages occurs—Carboniferous, Jurassic, and Tertiary. It is difficult to give the total content, but it may safely be said that Spitsbergen coalfields do not contain less than 5,000,000,000 tons. Bear Island, in addition, has a content of some 8,000,000 tons. The occurrence of drowned fault valleys in the plateau of almost horizontal strata has made the coalbeds easily accessible in most places, and greatly facilitates loading by reducing land transport to a minimum. Practically all the valuable coalbeds lie around the two great inlets on the west coast—Icefjord and Lowe Sound—except a small outlier of Tertiary coal in King's Bay, near the north-west corner of Spitsbergen. The Tertiary coal has attracted most attention, and for the present at least provides most of the export coal. At Longyear City, the prosperous Norwegian mine in Advent Bay, several seams have been located at 755 ft. above sea-level; a $3\frac{1}{2}$ -ft. seam is now being worked, and at 815 ft. a $4\frac{1}{2}$ -ft. seam is being opened; another seam occurs at 640 ft. The same coal is being worked in Lowe Sound and in Braganza Bay. In the latter place Swedes are exporting large cargoes from their mine in the $3\frac{1}{2}$ -ft. seam at a height of 245 ft. It is also being mined successfully by Russians in Green Harbour.

The Tertiary coal has been proved to be a good steam coal of high calorific value, and fairly free from dirt. An average of the analysis of several samples gives about 79 per cent. carbon, 2 to 6 per cent. water, less than 2 per cent. sulphur, and about 4 per cent. ash. The calorific value averages about 7800. The seams appear to maintain a fairly consistent thickness and uniformity in quality over wide areas. Other seams of Tertiary coal also occur, notably a 7-ft. seam of bituminous coal in Advent Bay at a height of 1900 ft. This seam, which is now being mined, shows a slight tendency to pass to lignite, an unusual feature in Spitsbergen Tertiary coal.

The coal of Carboniferous age occurs in the culm beds near the foot of the Carboniferous system. The deposits are very extensive, but have been investigated only recently, and so have attracted less notice than the Tertiary seams. Moreover, the outcrops of these coal seams are generally obscured by enormous scree and slip masses, so that their examination entails a good deal of serious work, including boring operations; but this is well repaid, as the seams are thick, and extend over wide areas round the northern