

- (9) Albite-porphyrates (with hornblende and biotite) and albite-porphyrates. Secondary minerals are common in the rocks of this group.
- (10) Jaspers and graphitic schists. These traverse all the other rocks, occurring as lodges or bands, and may closely resemble sedimentary schists. They sometimes are found running on each side of dykes of albite-porphyrates. Their mode of origin is not quite certain, but they are intimately connected with the igneous rocks.

The relation and the sequence of the rocks of Kalgoorlie are next discussed.

The greenstones, fine amphibolites, and calc-schists are regarded as the old 'country rocks', into which the others are intrusive. They are probably a complex of basic lavas, ashes, etc., greatly altered.

The quartz-dolerites, hornblende-dolerites, and pyroxenites are very closely related one to the other, and show every grade of transition. Probably the peridotite group is merely the early basic facies of the quartz-dolerite series, and the porphyries and porphyrites, which were the last rocks intruded, are regarded as being derived from the same magma.

The metasomatic changes and origin of the ores are then considered. The great characteristic of this gold-field is the prevalence of albitization in the auriferous districts. From this, and from a general consideration of the rock-facies developed from the magma, it seems probable that we have in Kalgoorlie an instance of the production of auriferous lodges by rocks belonging to the same class as the pillow-lavas and their diabases and soda-granite-porphyrates (the spilitic suite of igneous rocks).

The paper contains a large number of chemical analyses, principally carried out by the chemists of the Geological Survey of Western Australia. By the kindness of the Director of that Survey the author has also been able to make use of the specimens in the Survey cabinets, in addition to those collected during his own examination of the gold-field.

## CORRESPONDENCE.

### GRANITE AND CRITICAL TEMPERATURES.

SIR,—I have to thank Dr. Johnston-Lavis for two reprints, and especially for a marked list of 161 of his papers.

As my critical-temperatures inquiry has been confined to low-temperature plutonic rocks, down to their associated quartz-veins in adjacent sedimentary rocks, I cannot discover how I have in any way invaded Dr. Johnston-Lavis' field of work, either for agreement or dissent. There is no issue between us. His temperatures are far above the critical temperature of water, mine are almost entirely below it.

With respect to the possibility of granite cavities and fissures at great depths, which Dr. Johnston-Lavis denies, Sir T. H. Holland, in the Magazine for last month, cites Professor F. D. Adams as having proved that empty cavities can exist in granite under pressures equivalent to a depth of at least 11 miles, and at still greater depths if filled with liquids (*GEOL. MAG.*, 1913, p. 170).

Once-fissured granite is quite common, re-compacted by invasion of later granitic material. This is the fact, whether theoretically possible or not.

A. R. HUNT.

SOUTHWOOD, TORQUAY.

May 5, 1913.

#### THE RAISED BEACHES OF TORBAY.

SIR,—Mr. Jukes-Browne's somewhat sullen, chiefly personal, and wholly unexpected attack reminds me of the notice in the American saloon: "Do not shoot the performer. He is doing his best." As a raised-beach performer I enjoy, or once enjoyed, the very small distinction of having presented to geologists the longest list of shells recorded from any single British raised beach. I have therefore been much interested in the subject, and have endeavoured to keep myself abreast of recent discoveries.

Mr. Jukes-Browne, so far as I know, has never done a day's work on beach or raised beach. His attack is easily disposed of. To save space I will employ parallel columns.

A. J. J.-B., 1913.

"Apparently he [Mr. Hunt] has not realized that the whole question of the age of the raised beaches of Devon and Cornwall has entered an entirely new phase since the discovery that the raised beach of Gower (in South Wales) is older than the local glacial deposits."—*GEOL. MAG.*, 1913, p. 236.

A. J. J.-B., 1913.

"The beaches testify to a subsidence which culminated either just before or during the epoch of maximum glaciation."—*TRANS. DEV. ASSOC.*, 1913, p. 726.

A. J. J.-B., 1913.

"I have discovered what Mr. Hunt meant by . . . a Neolithic flint 'at Hope's Nose'."—*GEOL. MAG.*, 1913, p. 238.

"He [Mr. Hunt] indicates three lines of evidence, viz. those of flint implements, Molluscan fauna, and geographical position."—*GEOL. MAG.*, 1913, p. 237.

A. R. H., 1903.

"Mr. Tiddeman's evidence of the glacial age of the Raised Beaches of the Gower Peninsula has reopened the whole question of the Raised Beaches of the south-west of England."—*TRANS. DEV. ASSOC.*, 1903, p. 318.

I was present when Mr. Tiddeman read his paper on September 11, 1900.

Professor E. HULL, 1913.

"The chart . . . indicating [for Europe and the North Atlantic] a rise of 1,000 to 1,200 fathoms (6,000 to 7,000 feet) during the culminating stage of the Glacial Period."—*PROC. GEOL. SOC.*, 1913, p. 88.

A. R. H., 1904.

"The mere fact of the discovery of Neolithic *flakes* newer than the adjacent beach at Hope's Nose, Torbay, may be worth a bare record."—*GEOL. MAG.*, July, 1904.

There was nothing concealed, so nothing to be discovered.

"Geology, geography, conchology, physics, palæontology, archæology, anthropology, and even micro-petrology [I forgot spelæology, zoology, and chemistry], all seem to incline towards the conclusion," etc.—*GEOL. MAG.*, 1913, p. 107.

I never referred to 'implements'; and there are ten lines of evidence, not three.