The X-ray pattern agreed well with that of boulangerite given in A.S.T.M. card (9–470) and the cell dimensions for boulangerite were calculated as $a = 21{\cdot}54$ Å, $b = 23{\cdot}50$ Å, $c = 8{\cdot}10$ Å, $\beta = 101° 15'$.

A *chemical analysis* of the geocronite was carried out as follows:

The specimen was decomposed with a mixture of HCl–H_2SO_4–HNO_3. Pb was separated as $PbSO_4$ along with other insolubles. This was filtered and the residue was treated with ammonium acetate acetic acid mixture to remove $PbSO_4$, and the insolubles ignited and weighed. Pb was estimated as chromate in the usual manner. From the filtrate As, after reduction with SO_2, was removed by H_2S at 10 N acidity. As_2S_3 was dissolved in NaOH containing H_2O_2 and As was determined as magnesium pyroarsenate. From the filtrate after removing arsenic Sb was precipitated as Sb_2S_3 by passing H_2S at 1 N acidity. The Sb_2S_3 was treated with H_2SO_4–$KHSO_4$ and fumed to copious fumes to obtain a solution of Sb^{3+}. Sb was then estimated by titration with $KBrO_3$ using methyl orange as an indicator. Sulphur was estimated as usual by fusion with Na_2O_2.

The results were Pb 63·34, As 3·01, Sb 10·98, S 16·15, insolubles 6·10, total 99·58 %.

After deducting the insoluble, which was found to be silica, present as impurity in the mineral, the other constituents were recalculated to 100 %, giving Pb 67·77, As 3·21, Sb 11·74, S 17·28.

This agrees well with geocronite, $Pb_9(As,Sb)_4S_{15}$ (Douglass, Murphy, and Pabst, 1954). A chemical analysis of the boulangerite could not be carried out as a pure fraction was not available.

This appears to be the first reported occurrence of geocronite in India.

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Geological Survey of India,
29 Chowringhee, Calcutta-16,
India.

D. R. Dasgupta
B. C. Poddar
N. R. Sen Gupta

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Fortran IV programme for molecular norm calculation

A FORTRAN IV programme has been written for the calculation of molecular norms of igneous rocks according to the method of Barth (1962). Input to the programme consists of N (the number of analyses to be

input) and N sets of two data cards containing the chemical analysis for each rock. The output consists of weight percentages, equivalent molecular weights, cation proportions, cation percentages, and the norm of the rock.

Another programme for molecular norm calculation is in existence (Vitaliano *et al.*, 1965). However, since it was written for a first-generation, somewhat outdated, computer (the IBM 650) it is felt that there was a need for a more modern programme.

A listing or source deck or both may be obtained from the authors.

Southern Illinois University,
Carbondale,
Illinois 62901, U.S.A.

J. F. CERVEN
P. D. ROBINSON
J. H. FANG

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BARTH (T. F. W.), 1962. Theoretical Petrology. New York (Wiley).
VITALIANO (C. J.), HARVEY (R. D.), and CLEVELAND (J. H.), 1965. Amer. Min., vol. 50, p. 495.

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BOOK REVIEWS

BAYLY (BRIAN). *Introduction to petrology.* New Jersey (Prentice-Hall), xix+371 pp., 1968. Price 93*s*.

Occasionally a textbook appears on petrology that represents a deviation from established pedagogic methods. This is one of them. The book is divided into five main parts dealing with crustal processes, igneous, sedimentary, and metamorphic rocks, and a large appendix. As the author notes in the preface, those already familiar with elementary petrology, mineralogy, physics, and chemistry will gain most from the book. This is certainly true and students with no knowledge of geology and/or physical science would probably find the book hard going since there is no attempt to supply the usual digest of factual material to be memorized. The discussions rely, and rightly so, upon the application of experimental data to petrology and one fault of the book as an introductory text is insufficient mineralogy and a lack of actual field examples, the latter admitted by the author. Readers already familiar with the hardware of petrology will be stimulated by this type of approach: beginners bewildered. There is no formal treatment of rock-forming