DISCUSSION

This section is intended to provide a forum for the discussion of papers published in our Journal by those working in similar fields of investigation and research. Such a discussion is expected to be of value not only to the actual workers in the concerned field, but also to a wider circle of readers interested in the progress of geological studies.—Editor.

Paper 'ON THE ALKALI SYENITES OCCURRING NEAR KUNDULUR, KHAMMAM DISTRICT A.P.' by S. Chakravarti, published in the Journal (Vol. 13, No. 3, pp. 289-292, September, 1972).

Comments by Y. Janardan Rao and I. S. N. Murthy (Osmania University, Hyderabad).

The paper by Chakravarti on the Kundulur alkali syenites provides useful information on these interesting rocks. These appear to be a further extension of Vinayakapuram-Kunavaram alkali syenite belt, showing similar geological setting and structure. Based on the account given by Chakravarti wherein he compares the Kundulur alkali syenites with those of Koraput and Kunavaram (Bose, 1970; Bose *et al* 1971), it is presumed that the author advocates a magmatic origin for these rocks. Field evidences given by the author on the other hand do not tally with the conclusions drawn, viz. that they are 'emplaced' into the biotite gneisses, amphibolites and granulites of the area. Further, the classification of these syenites by the author in support of Bose *et al*, (1971) into three groups seems to be motivated by a desire to fit them into a certain sequence of magmatic evolution, corresponding to distinctive periods. The detailed geological studies in Vinayakapuram-Kunavaram area (Janardan Rao and Murthy, 1970), revealed that in the so called pyroxene bearing perthite syenites, as in nepheline syenites, both hornblende and biotite are also fairly abundant. Further, the single analysis of biotite-nepheline-syenite presented by the author is too inadequate to compare it with Kunavaram and Koraput biotite-nepheline-syenites. It is to be noted that the variation of oxides in the plutonic rocks could be due to different reasons. In the Vinayakapuram-Kunavaram nepheline syenite band, we have recorded silica content much lower than Kundulur nepheline syenites; and moreover the variations in the oxides are quite substantial (Janardan Rao and Murthy, 1970; Subba Rao, 1971). The higher percentage of K_2O in comparison with Na_2O in the alkali syenites of Khammam District, when compared to alkali syenites of other parts of India and Canada, is a striking feature which needs rational explanation.

The analysis given by the author falls in the leucite field of petrogeny's residua system (Hamilton and Mackenzie, 1965). The crystallization of nepheline in the field of leucite cannot be explained, particularly when the prevailing temperatures are high. This raises the doubt whether the formation of the nepheline syenites of this area can be correlated with the phase equilibria studies in the system Ne-Ks-Qz-H_2O. In this connection, it is to be noted that the plots of the analyses of Kunavaram (Bose *et al*, 1971) and Kundulur fall away from the thermal valley (towards

potassic field), and this can be possibly interpreted as due to metasomatic origin (Hamilton and Mackenzie, 1965, p. 229).

It appears that the nepheline syenites of Khammam district are similar to those of the classic region—Haliburton-Bancroft area, Canada,—where different origins were proposed; but the widely accepted theory of nephelinization (Tilley, 1957, Gittins, 1961) for the formation of nepheline gneisses can also be reasonably applied to the nepheline syenites of Kundulur area. This is consistent with the field and petrographic descriptions given by the author. It is essential to point out that in tracing the evolutionary history of alkaline rocks of Khammam area, relevant conclusions can be drawn only on the basis of very detailed observations.

REFERENCE

BOSE, M. K., CHAKRAVARTI, S. and SARKAR, A., (1971) Petrological observations on alkali syenites of Kunavaram, A.P., India, *Geol. Mag.*, v. 108, pp. 273-280.

GITTINS, J., (1961) Nephelinization in the Haliburton-Bancroft District., Ontario, Canada, *Jour. Geol.*, v. 69, pp. 291-308.

HAMILTON, D. L. and MACKENZIE, W. S., (1965) Phase-equlibrium studies in the system $NaAlSiO_4$ (Nepheline)-$KAlSiO_4$ (kalsilite)-SiO_2H_2O. *Miner. Mag.*, v. 34, pp. 214-231 (Tilley Volume).

JANARDAN RAO, Y. and MURTHY, I. S. N., (1970) The alkaline rock complex of Vinayakapuram-Kunavaram area, Khammam District, A.P., *Jour. Ind. Geoscience Assoc.*, v. 12, pp. 57-75.

SUBBA RAO, K. V., (1971) The Kunavaram series—A group of alkaline rocks, Khammam Dist., A.P., India, *Jour. Petr.*, v. 12, pp. 621-641.

TILLEY, C. E., (1957) Problems of alkali rock genesis, *Quart. Jour. Geol. Soc. Lond.*, v. 113, pp. 323-360.

Author's reply

The syenites of Kundulur area do not appear to be the spatial extension of the Kunavaram pluton as surmised by Janardan Rao and Murthy. A number of occurrences of alkali syenites having comparable petrographic characters are reported from the Eastern ghats orogenic belt (Bose, 1972) and even within Andhra Pradesh, such syenitic rocks occur near Elchuru, Guntur district. To an attentive reader it would be evident that in my communication (Chakravarti, 1972) I have not shown the Kundulur syenites to have similar structural frame work as the Kunavaram-Vinayakpuram pluton; geometry of the latter corresponds to a south-easterly plunging synform at the northern termination, whereas towards south it attains the form of a sheet (Bose *et al*, 1971, Bose and Ghosh Roy 1972). The Kundulur syenites, on the other hand, occur as thin concordant bands. Janardan Rao and Murthy have attempted a closer comparison between the two occurrences than that desired by the author himself (Chakravarti, 1972), but have failed to provide any further information or data on the Kundulur occurrence on which my brief communication is based. To any cautious worker the similarity between the two occurrences will be evident particularly in respect of petrographic and associational characters of the syenites, although the Kunavaram pluton develops a wider spectrum of rock compositions (Bose 1972, Bose and Ghosh Roy 1972).

Chemicomineralogical characters of the Kundulur syenites have already been pointed out by the author and are only repeated by Janardan Rao and Murthy. A closer acquaintance with the role of water in Petrogeny's Residua system would help

one to judge the significance of rock compositions plotted in the system wherein the leucite field is remarkably and progressively reduced with increasing water pressure (Hamilton and MacKenzie 1965, Morse 1969). Also there are instances where the maximum for modern analyses of syenitic rocks deviate from temperature minimum (Morse, 1969). It should be known to students of the alkalic rocks that the syenites of the type we are discussing, have constituents other than those in the Petrogeny's Residua system, and they considerably mould the trend of crystallisation.

Janardan Rao and Murthy have oriented their discussion to refer repeatedly to their own work (Janardan Rao and Murthy 1970) in which the map for the Kunavaram pluton has striking similarity with that published elsewhere (Subbarao 1971) with common imperfections particularly in delineating the eastern border of the pluton. Further, the supposed criteria for replacement phenomenon in the rocks (Janardan Rao and Murthy 1970) lack in any crystallochemical interpretation. The comments by Janardan Rao and Murthy seem to be motivated by a desire to push their own notion on the petrogenesis of the Kunavaram pluton thus ignoring the main theme of my contribution. Subordinate replacement phenomenon is often associated with a solid-melt interface and it is the task of a faithful worker to assess the importance of such a phenomenon.

References

Bose, M. K., (1972) Petrology of the alkalic rocks from the Precambrian Eastern Ghats orogenic belt of India. *Internat. Geol. Cong. 24th Sessn. Sec. 14.*

Bose, M. K. and Ghosh Roy, A. K., (1972) Petrology of the igneous suite around Rudramkota, Khammam, A.P. *Proc. Ind. Sci. Cong. 59th Sessn.*, Pt. 3. pp. 183-84.

Bose, M. K., Chakravarti, S. and Sarkar, A., (1971) Petrological observations on alkaii syenites of Kunavaram, A. P., India *Geol. Mag.*, v. 108, pp. 273-80.

Chakravarti, S., (1972) On the alkali syenites occurring near Kundulur, Khammam Dist., A.P. *Jour. Geol. Soc. Ind.*, v. 13, No. 3, pp. 289-92.

Hamilton, D. L. and MacKenzie, W. S., (1965) Phase equilibrium studies in the system $NaAlSiO_4$-$KAlSiO_4$-SiO_2-H_2O. *Miner. Mag.*, v. 34, pp. 214-31 (Tilley Volume).

Janardan Rao, Y. and Murthy, I. S. N., (1970) The alkaline rock complex of Vinayakpuram-Kunavaram area, Khammam Dist., A.P. *Jour. Ind. Geosc. Assoc*, v. 12, pp. 57-75.

Morse, S. A., (1969) Syenites. *Carnegie Inst. Wash. Yr. Bk.*, v. 67, pp. 112-20.

Subbarao, K. V., (1971) The Kunavaram Series—a group of alkaline rocks Khammam, A. P., *Jour. Petr.*, v. 12, pp. 621-41.