ORIGIN OF CELESTITE IN THE CRETACEOUS BEDS OF TRICHY

By N Jayaraman

The presence of celestite in the phosphatic nodules led the author to look for its occurrence outside the nodule also viz, in the clay beds in association with gypsum A trip to the area was arranged and a detailed examination of the clay beds north-east of Utatur revealed the presence of large quantities of celestite The presence of this mineral was first noticed by Sivan[1]

The mineral occurs along with gypsum as lumps of varying sizes Masses weighing 50 to 60 lbs are commonly met with These masses are made up of radiating and parallelly arranged columnar crystals of celestite The individual columner crystal of such masses has a maximum thickness of about 0 5 cm and a maximum length of about 7 cms An unaltered specimen gives on analysis 95 per cent $SrSO_4$

These lumps of celestite were found to be in varying stages of alteration, the main product of alteration being a fibrous strontianite In many places the original celestite blocks have been completely altered to strontianite and in some they have given place to an yellow earthy amorphous material This material was also found to be mainly strontium carbonate and it was mixed with large quantities of silica and other impurities

The celestite and its alteration products are found occurring in small isolated heaps over a large area covering 16 to 20 square miles

In this connection, it is interesting to note that in this area which is very rich in ammonite fossils, thick celestite layers generally occur around casts of ammonite shells Occasionally large casts of ammonite shells which have been more or less completely phosphatised are found bearing a thick outer layer of celestite This layer varies in thickness from 1 cm to nearly 4 cms and it is made up of fibrous celestite crystals the individual fibres of which are arranged perpendicular to the surface of the cast This layer of celestite as well as the individual large lumps very often exhibit banding at right angles to the

length of the individual fibre or crystal This banded structure is correlated with change of colour and slight variation in composition Further, this banding in the celestite indicates that the strontium compound was derived by periodic deposition from a solution This definitely proves that this celestite is not of primary origin but that it is due to secondary enrichment A chemical examination of the surrounding strata revealed the presence of strontium in almost all localities As these cretaceous formations are exceptionally rich in radiolarian remains[2], it is probable that some of these radiolaria abstracted the strontium from the sea water to form their shells It follows that those shells on coming in contact with underground waters heavily charged with carbondioxide yielded the strontium which would be present in solution as $Sr(HCO_3)_2$ When this solution of strontium bicarbonate came in contact with gypsum, it was slowly precipitated as strontium sulphate, viz, the celestite observed The presence of gypsum in the vicinity of the celestite deposits therefore lends support to this view Further, the amount of gypsum actually present on the spot in which the celestite occurs is very much smaller than that present in the surrounding strata showing therefore that most of the originally present gypsum has been replaced by celestite

Summary—1 A short description is given of the occurrence of celestite in the clay beds of the cretaceous rocks of Trichy

2 The celestite is shown to be of secondary origin It is suggested that the strontium required was initially collected and concentrated by sea organisms, especially by certain types of radiolaria, and that later on it was taken up in solution as $Sr(HCO_3)_2$ by underground circulating waters From this solution strontium was redeposited as the sulphate owing to interaction with gypsum

The author wishes to express his indebtedness to Dr K R. Krishnaswami, D Sc (London), F I C , for much helpful criticism

FIG 1

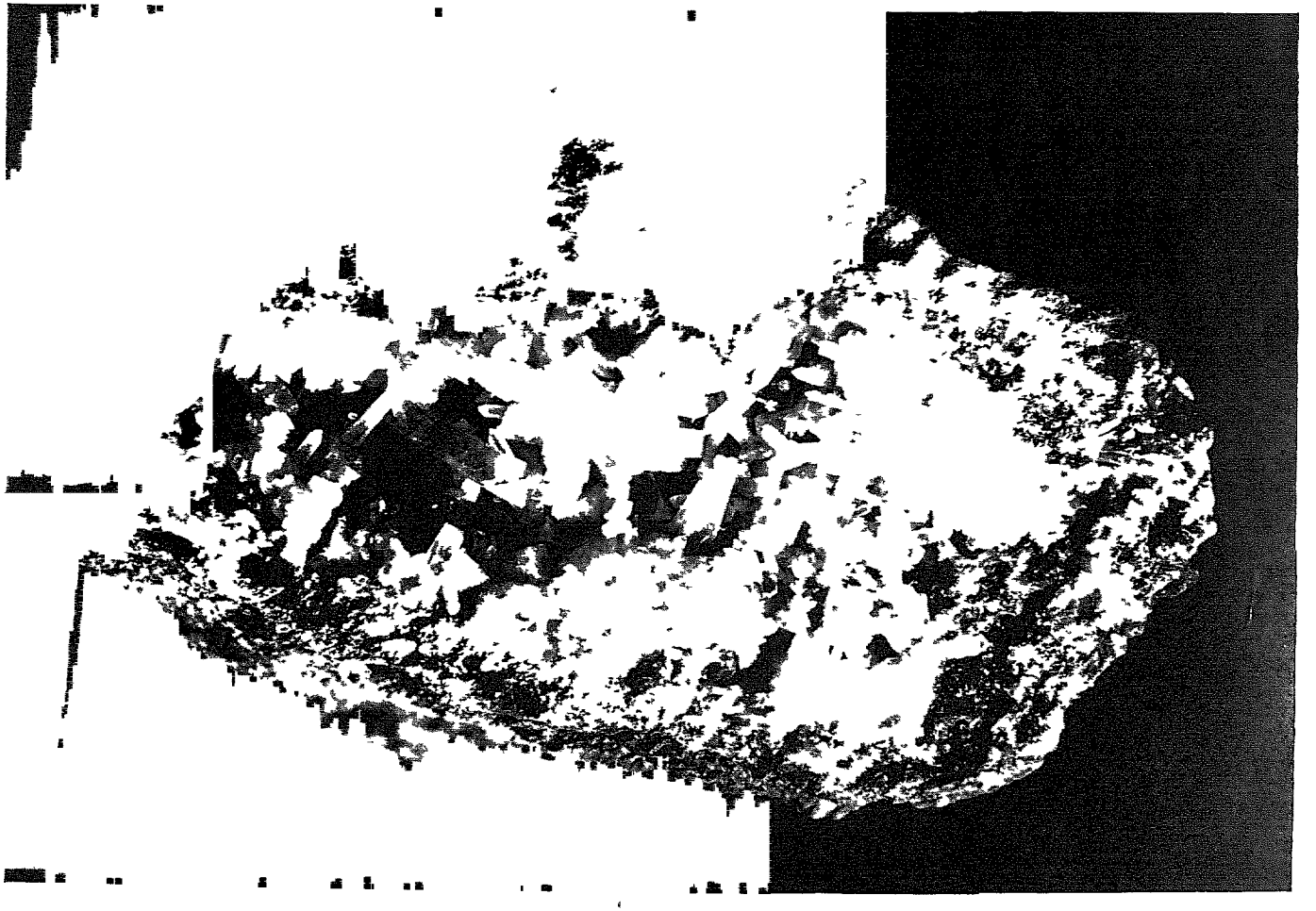

FIG 2

REFERENCES

1 Sivan, *Mem Dept Agri Ind Chem Sci*, Vol **7**, p **149**, (1925)
2 Rama Rao, *Jour R Mic Soc*, Vol **52**, p 357, (1932)
3 Dinger, *Chem Erde*, Vol **4**, p 167, (1929)

PHOTOGRAPHS

Fig 1 —A broken ammonite cast showing the fibrous celestite layer (c)-natural size

Fig 2 —Celestite crystals lining the walls of cavity in a celestite block-natural size

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