PSEUDOMORPHOUS CALCITE CUBES FROM KOYANANAGAR, MAHARASHTRA, INDIA

During their visits to Koyananagar (17° 24' N.; 73° 45' E.) immediately after the severe earthquake of 11th December 1967, the authors came across some excellent specimens of calcite showing an almost perfect cubic form. These occur in druse cavities in basalts and are associated with stibnite. The calcite cubes are colourless, transparent, and almost uniform in size with edges measuring about 1 cm. Goniometric measurements of interfacial angles showed an exact value of 90°. Interpenetration twins are quite common. Microscopic examination clearly reveals that the mineral under study is calcite showing uniaxial negative interference figure, and refractive indices measuring \( n_e = 1.486 \) and \( n_o = 1.658 \). It is apparent that the calcite, in this case, is pseudomorphous after some mineral belonging to cubic system. None of the druse minerals in basalts of the Deccan, save analcime, have a cubic symmetry. Analcime shows a trapezohedral form and thus the morphology of calcite under reference does not fit this mineral. The occupants of the druse cavities in basalts are generally low temperature minerals, and the development of the cube (1 0 0) form of the original mineral represented by calcite is consistent with this. The interpenetration twins noted here are of common occurrence in the mineral fluor spar.

Fig. 1. Pseudomorphous calcite cubes from Koyananagar.

The cube form of calcite is here believed to be due to the replacement of fluor spar which had earlier crystallised from late stage magmatic emanations and had deposited in cavities. In this connection it may be stated that Subramaniam and Parimoo (1963) have attributed the genesis of fluor spar deposits of Amba Dongar, directly to the Deccan volcanism of India, and have believed that the mineralising solutions were given out by the basaltic magma during the fumarolic stage. Crystallisation of fluor spar in the druses in basalts of Koyananagar before being replaced by calcite could thus be possible.

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PLEISTOCENE DEPOSIT AROUND ARIYALUR (MADRAS)

The area around Aiyalur is well known for its Cretaceous invertebrate fossils, while Dinosaur bones have also been described from this region. Except for a note by Matley (1929, p. 346) in which he refers to certain mammalian remains, no other forms have been reported from the area. A collection made by this Department in 1962 contains, among other remains, a tooth of Equus (No. T/65) which has been recently identified by the author during the course of rechecking the Aiyalur materials. The specimen is well preserved except for the parastylid, external margin and part of the root.

The tooth is long (18 mm.), narrow (9 mm.) and hypsodont (55 mm.) and is posteriorly concave showing the characters of a last lower right molar. The valley between the metaconid and metastylid is U-shaped which is a caballine rather than a zebrine character. This leads to the conclusion that the molar may belong to Equus namadicus rather than to Equus srulensis.

Pilgrim (1929, p. 346) identified the mammalian remains collected from this area by Matley as Equus and Bos (or Buffelus) and thought that these materials had been derived from the Cuddalore sandstone (Pliocene), whereas the present find indicates that there are some isolated patch of Pleistocene in the area since, according to him (1939 and 1944) Equus srulensis lived during Pliocene and Equus namadicus during Pleistocene. Further, the matrix of the present specimen is the same earthy, calcareous, as that of the Cretaceous invertebrate fossils of Aiyalur, whereas the
Cuddalore sandstone is ferruginous (King, 1864, p. 34). Therefore, thorough search is likely to bring to light other isolated patches of Middle Pleistocene deposits in the area.


4. —., The Lower limit of the Pleistocene in Europe and Asia, Geol. Mag., 1944, 81, 23.

NOTE ON THE OCCURRENCE OF PHOSPHATE IN ARU VALLEY, KASHMIR HIMALAYA

A field survey was recently undertaken around Aru (34° 5' : 75° 15') about 13 km. north-west of Pahalgam. The Permians are exposed in the valley. The upper band of limestone of this age is phosphatic. The maximum percentage of $P_2O_5$ in this area is only 8.65. Though this percentage is not economically important, it was felt that this occurrence should be recorded. The common phosphate mineral is collophane.

GEOLGY OF THE AREA

In the Aru Valley, about 2 km. south-east of Aru village, the Permians are seen to be overlying the Traps (Fig. 1). The general sequence of this series is as follows:

--- T R A P S ---

Sandstone
Shale

![Diagram showing stratigraphy](image)

Limestone
  Upper Band
  Middle Band
  Lower Band

--- T R A P S ---

The lower band of the limestone is unfossiliferous, dark-coloured and soft, while the middle band, which is the thinnest of the three bands of the limestone, is fossiliferous and dark-coloured. The fossils are:

Coeleterates—*Sinophyllum* sp.
Bryozoans—*Prototetepora ampla*
*Polypora* n. sp.

Besides these fossils, there are many others which could not be identified due to their poor mode of preservation.

The upper limestone band is siliceous, brownish in colour, and much harder than the two lower bands. This particular band is phosphatic in nature; the range of $P_2O_5$ is between 4.55% and 8.65%.

Conformably overlying this limestone is shale which is chocolate-coloured, unfossiliferous, very friable and breaking into needle-shaped fragments. The sandstone which conformably overlies the shale is also unfossiliferous.

On the top of this series there is again Panjal Trap which is green-coloured and massive.

*Mode of Occurrence of Phosphate.*—The phosphate mineral present in the Permian limestone of the Aru Valley is black opaque collophane. It occurs in the form of pellets (Fig. 2), stringers (Fig. 3), clots (Fig. 4), and along the interlaminal partings of the stromatolites (Fig. 5). The size of the pellets of collophane ranges from a fraction of a millimetre to about two centimetres. The tops and the saddles of the branched stromatolites columns display relatively thicker encrustation of the collophane. This mode of occurrence is similar to those described by Valdiya from the Pithoragarh area of Kumaon Himalaya.

![Figures 2-5 showing geological and mineralogical features](images)