

CALCAREOUS ALGAE AS INDEX FOSSILS

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ALTHOUGH they are found in rocks of all ages from Proterozoic to Recent, calcareous algae are seldom used by stratigraphers as index fossils. The failure to use these plants to correlate sedimentary rocks and determine their age has been due in part to the stratigraphers' lack of knowledge of these fossils (many stratigraphers pass over them in the field without even seeing them) and in part to the fact that, although many species have been described, few palaeobotanists have ever studied this group of plants carefully. Yet recent attempts to use calcareous algae have demonstrated their value as index fossils, and their abundance in Palaeozoic and Proterozoic formations, where other diagnostic fossils are often lacking, makes them very important index fossils in the sedimentary rocks of those eras.

The writer is not a palaeobotanist, and he knows very little about the microscopic details of the fossils of the lime-secreting algae; but he has used them in the field to correlate Cambrian rocks, and he is convinced that, when they are more thoroughly studied and more widely known, they will prove to be valuable, and frequently indispensable, aids to the stratigrapher. He also believes that they can be used in working out many palaeogeographical problems.

Now that a great centre for the study of the plant life of the past has been established in India, he would like to call the attention of palaeobotanists, through the journal of this institution, to the need for further study of the fossils of these lowly plants and to the desirability of using them more frequently as time and facies indicators. Through the kindness of Mrs. Sahni he has been afforded an opportunity to publish in the journal of the Institute of Palaeobotany this plea for a more intensive study of these fossils and for their wider use in stratigraphical work.

Only a few palaeobotanists have specialized in the study of calcareous algae. Julius Pia devoted much of his life to the description of these plants, and his book, *Pflanzen als Gesteinsbildner*, published in 1926, is a

very valuable compendium of the knowledge concerning them that was available at that time. Since then Dr. C. D. Walcott, Dr. C. L. Fenton, Dr. M. A. Fenton, and Professor J. Harlan Johnson, in America, V. P. Maslov, in Russia, Dr. Lucien S. Cahen and his co-workers, in the Belgian Congo, and other investigators have published descriptions of these fossils, and Professor Johnson has called attention to their value as index fossils. But many more species remain to be described, and palaeontologists and stratigraphers generally know little about them, and do not realize how numerous they are and how useful these plants can be to them in their work.

Fossil calcareous algae are often conspicuous in the field. When found, they are generally in large reefs, and specimens are difficult to collect and are heavy objects to carry home. In the laboratory they must be etched and polished, and their smaller details can usually be studied only in thin sections. All this has led stratigraphers to pass them by, and most palaeobotanists have neglected them because of a greater interest in the fossils of the higher plants, whose remains are more beautiful in their eyes and easier to identify. Yet these algae are abundant in many sedimentary rocks, and they are the only fossils present in many ancient limestones. They deserve more consideration from both palaeobotanists and students of stratigraphy.

Of course, only a palaeobotanist can hope to become proficient in the study of calcareous algae in the laboratory; but stratigraphers can easily learn to recognize the species that they find in the field and to use them in their work. Often several different species that can be told apart without difficulty in the field are found in the rocks of a single area and can be used to identify the various formations in their separate outcrops. As they are often the only fossils in the particular beds in which they occur, they are frequently invaluable index fossils. Indeed, in Proterozoic limestones they offer almost our only means of making correlations between the formations of different

areas. Also, since calcareous algae must always have lived in shallow waters, their fossils must have been buried in sediments that were deposited not far from the shore, and such fossils can, therefore, be used to locate the approximate positions of ancient coasts, reefs and bars, and from them we can determine the geography of ancient times and the depths of the waters in which they grew.

It is hoped that more palaeobotanists will turn their attention to these neglected plants

in the future and that they will tell the stratigraphers which species are characteristic of their various formations. When this has been done, and when those of us who teach graduate students who plan to work on sedimentary rocks tell them how to recognize and use calcareous algae in the field, these plants will surely be more often found and more effectively employed by our successors in the solution of stratigraphic and palaeogeographic problems.