

FOSSILS FROM THE PRE-CAMBRIAN OF CHARNWOOD FOREST, LEICESTERSHIRE

by

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Summary

New records of fossils from the Pre-Cambrian rocks of Charnwood Forest have been made by a team of Adult Education students under the leadership of the author.

Fossils discovered, of the phylum Coelenterata, include *Cyclomedusa cf. davidi* Sprigg and *Cyclomedusa* sp., both of which were first recorded from Ediacara, South Australia. Certain other fossils are considered to be medusae or problematica. These are discussed and compared with forms from Newfoundland and Ediacara.

Further observations on *Charniodiscus concentricus* Ford suggest that his original ideas on their affinities to Himanthalian seaweeds may be correct.

Introduction

The latest search for fossils in Charnwood Forest started after a discussion on "Life in the Pre-Cambrian" at an Evening Class in 1976. Twelve students and their families spent many hours examining rock outcrops in the Forest. The results of this survey have yielded interesting specimens of Pre-Cambrian fossils not recorded previously in this country.

In past years the following papers concerned with the present study have been published. Hill & Bonney (1877) noted some "curious concretionary markings" in the "northern slate quarry at Hanging Rocks" but "disposed of their claim to be organic". Watts (1947) mapped the Geology of Charnwood Forest and divided the Pre-Cambrian rocks into the following groups which are still the basis of the stratigraphy today (Ford, 1968). They are as follows:-

Group C	Brand Series	{	3. Swithland Slates
			2. Trachose Grit and Quartzite
			1. Hanging Rocks and Conglomerate
Group B	Maplewell Series	{	4. Woodhouse and Bradgate Beds
			3. Slate-Agglomerate
			2. Beacon Hill Beds
			1. Felsitic Agglomerate
Group A	Blackbrook Series	{	Blackbrook Beds

Watts postulated there was an increase in volcanic activity by the deposition of ashes which started in Blackbrook times, reached its maximum in the Maplewell Series and died away during the formation of the Brand beds. He also described the various intrusive members.

In 1957 a schoolboy, Roger Mason found the first fossils, from the Woodhouse Beds (Ford, 1958). They were named *Charnia masoni* Ford (featherlike structure attached to a disc) and *Charniodiscus concentricus* Ford (disc only). This author thought them to be algae of Himanthalian type (brown seaweed). In the later paper, Ford (1962), reported that Glaessner suggested a comparison of these Charnian fossils with modern Pennatulids (sea pens), based

on finds made in Australia and Africa (Glaessner, 1959). *C. concentricus* was later found at a second locality in Charnwood Forest (Ford, 1963). The various affinities of this fossil were reconsidered and it was concluded that an open mind be kept until further work had been undertaken. In (1968) he recorded a larger disc-like impression which he called *Cyclomedusa davidi* Sprigg (locality and horizon unspecified).

Ages of Charnian rocks, based on radio-active dating of the intrusive members, have appeared in three papers. Miller & Podmore (1961) dated the markfieldites (southern diorites) by the potassium-argon method at 690 million years old. They are intruded into the Woodhouse Beds in which fossils were found, thus making these sediments more than 700 m.y. in age and placing them in the younger Pre-Cambrian. Meneisy & Miller (1963) described the sedimentary rocks as ranging from 600 m.y. to 684 m.y. by the K-Ar. method, based on dating of some of the porphyroids, markfieldites and the Mountsorrel Granite. Cribb (1975) using the rubidium-strontium method, recorded the markfieldites as being 552 ± 58 m.y. and concluded that they were probably late Pre-Cambrian or early Cambrian in age. He said that they were younger than was originally thought, and considered that the slates into which they were intruded were Brandian in age; an idea which was originally postulated by Hill & Bonney (1878).

Pre-Cambrian fossils have been found from other localities in the world and two of these are used for comparison with the Charnian fossils. In the 1940's a fauna of jellyfish medusae and polychaete worms was discovered in the Pound Quartzite at Ediacara, South Australia. These were described in several papers of which Sprigg (1947), Sprigg (1949), Glaessner (1959), Glaessner & Daily (1959) and Glaessner & Wade (1966) are some. *Cyclomedusa* was first described and named by Sprigg (1947). In 1969, Misra described dendritic, leaf-like and circular impressions from Mistaken Point, Newfoundland, Canada. One medusa and one problematical impression from Charnwood Forest are compared with those from the Canadian locality.

Pre-Cambrian Fossils

Many exposures of Pre-Cambrian rocks in Charnwood Forest were examined for fossils. In addition to direct observation and photographs, 'brass-rubbing' techniques have been borrowed from the art world to aid interpretation of organic remains observed in the rock faces. This technique (a first, for The Mercian Geologist) consists of placing plain paper over the fossil and producing an image, by rubbing the surface of paper placed over the object, with Cobbler's heel wax. Text-fig. 2, p. 294 was produced in this way and then photographed and enlarged slightly. Organic remains have now been recorded from the Blackbrook Beds, the Woodhouse Beds (most specimens) and the Brand (?) Beds. The last correlation depends on Cribb's latest interpretation of the age of the slates into which the markfieldites are intruded.

In the interest of conservation details of localities have been withheld from this article, although they were given to the Editor and made available to the Referee. Details of the localities will be given by the author to *bona fide* research workers in this field.

Description of the fossils

New Charnian fossils were recorded from five localities. They have been allocated either to the genus *Cyclomedusa* or to the taxon, problematica.

Phylum Coelenterata

Class Hydrozoa (?) or Scyphozoa (?)

Genus *Cyclomedusa* Sprigg, 1947

Cyclomedusa cf. *davidi* Sprigg, 1947 (Plates 21, figs 3 & 4, and 22, fig. 1).

From a loose block of fine-grained ashes of possible Brand age, four specimens of *Cyclomedusa* cf. *davidi* Sprigg, 1947 were seen on a bedding plane. This was broken during quarrying and parts of three specimens retrieved. All four specimens were ovoid in shape

with a slightly convex raised outer ring which was separated from an ovoid, central raised disc by a concave shallow depression. Specimens 1 (lost) and 2 measured 10×6 cm (Plate 21, fig.4); specimen 3 17×10 cm (Plate 21, fig.3) and specimen 4 had a flatter mineralized outer ring, extra inner ring and flatter central disc; this measured 17×8 cm (Plate 22, fig.1). The three retrieved specimens showed some scalloping or frilling of their outer rings. All four were preserved as impressions. They have been placed in the species *Cyclomedusa* cf. *dauidi* but tend to be larger than those originally described by Sprigg (1947) and do not show the pronounced radial lines of *C. gigantea* Sprigg.

Cyclomedusa sp. (cover photograph and Plate 21, figs. 1 & 2)

Four specimens of this genus were found on a bedding plane of the Woodhouse Beds. Two were well-defined, the third poor and the fourth broken. All four were ovoid in shape with their axes of greater length parallel with the cleavage direction which possibly indicated some deformation during metamorphism. The two well-preserved specimens showed prominent concentric, closely-spaced rings with a slightly raised small central disc from which issued one or two ill-defined bud-like structures. The largest specimen measured 22×16 cm, the second 7.5×2.2 cm and the remaining two were smaller and/or incomplete. The two larger specimens have also been likened by the author to *Madigania annulata* Sprigg 1949 which Glaessner & Wade (1966) placed in the genus *Cyclomedusa*.

Problematica

Six specimens of unknown affinity are regarded as problematica. They have been compared with forms from Newfoundland and Ediacara.

1. *Medusae* (?) Plate 22, figs. 2 & 3.

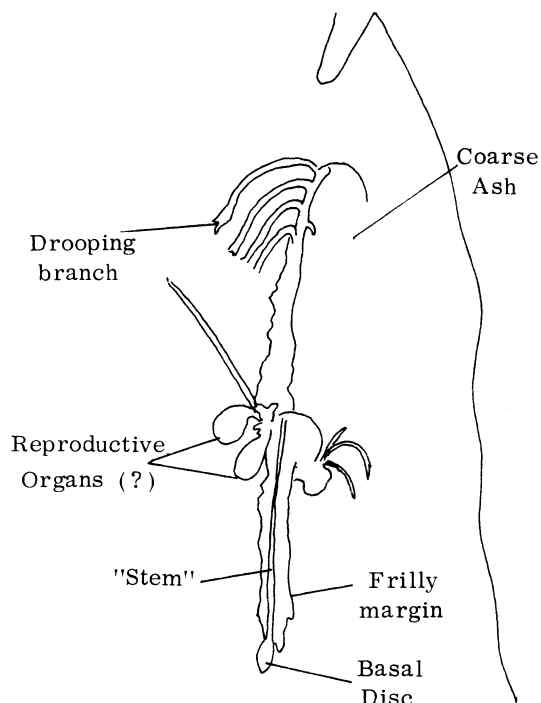
Three specimens of possible medusae were found on a bedding plane of the Blackbrook Beds, the oldest Charnian group of rocks. Each had slightly different morphology. One showed a three-fold form which may represent budding. Two circular medusae adjacent to each other showed pronounced internal structure and the third bud was only partially preserved. The whole organism measured 15×15 cm and the structures were represented by raised fairly thick ridges. The second specimen was more ovoid in form with a margin of wispy "curls" on it and again traces of internal structure. The long axis measured 12 cm. The third was circular in shape with an irregular margin and well-pronounced internal structure. It was poorly preserved but not unlike an unnamed form pictured by Misra (1969 Plate 6B).

A fourth specimen (Plate 22, fig.4) was found on a bedding plane at Markfield. This medusa (?) showed a single ovoid ring with raised ridge margin and two small knobs internally. It measured 15×9 cm and could be compared with a deformed shape of *Beltanella gilesi* Sprigg, 1947.

2. Two specimens of another problematical fossils were found in coarse-grained ash of the Woodhouse Beds. The larger one showed a well-defined basal knob-like disc from which arose a "stem" 13 cm long which was of fibrous nature and had frilly margins. After careful washing more structures appeared. The stem was offset to one side and from the apex there appeared to be a number of drooping branches. Halfway along the stem several sac-like structures could be seen which might have been reproductive organs. The smaller specimen was very poorly preserved and showed only drooping branches from a "stem". It may have been a juvenile form. A sketch showing this morphology taken from Plate 23, fig.1 is shown in text-fig.1, p.294.

3. "Water lily-like" fossil

From the *Charnia* crag (Ford, 1963) a "water lily-like" fossil was noted Plate 23, fig.2) and is likened to a dendrite-like organism featured by Misra (1969 Plate 6A).



Text-fig.1. Line drawing of "Arborea" taken from photograph. This fossil cannot be likened with any certainty to recorded fossils. A tentative suggestion is made here, that the specimens show some similarities to the species *Arborea arborea* Glaessner & Wade (1966). This genus was first called *Rangea* Glaessner & Daily (1959), *Rangea* being the name given to forms allied to *Charnia masoni* Ford, by Glaessner (1959).

Further notes on *Charniodiscus concentricus* Ford

Discs of *Charniodiscus concentricus* were studied in detail from Bradgate Park and Nanpantan. One part of the bedding plane of the *Charnia* crag was chosen for detailed wax rubbing. It measured two square feet and showed a cluster of discs with apparent long fronds attached and intertwining of the discs. Some of the fronds showed dichotomy at the tips. From a nearby crag of the Beacon Hill Beds possible associated fronds are shown in proximity to two discs (Plate 23, fig.4).

Two discs, one on the *Charnia* crag and one from Nanpantan, appeared to show a stipe or frond arising from a disc (Plate 23, fig.3).



Text-fig.2. Wax rubbing of a disc from which arises a short branch; from a bedding plane at Nanpantan (x3).

The possible proximity and/or attachment of discs and fronds suggests that the original idea (Ford, 1958) of *C. concentricus* being the disc attachment of a Himanthalian seaweed may be correct and that these organisms lived and died in colonies.

Acknowledgements

I would like to thank the twelve students and their families for their hard work in the searching of the Charnian rocks. My special thanks go to Mrs. M.J. East and to my husband and daughter for their unfailing enthusiasm and careful observations. I gratefully acknowledge the help of a number of professional colleagues, especially Dr. T.D. Ford, and thank land owners who granted permission to visit their properties.

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Explanation for Plates 21-23, Cover (this issue)

- Cover photograph *Cyclomedusa* sp. Sprigg ($\times 0.5$). Woodhouse Beds. Direction of cleavage shown by five broken lines parallel with the long axis of the medusa. (Photograph by D. Boynton).
- Plate 21. fig.1. *Cyclomedusa* sp. Sprigg ($\times 0.5$) showing concentric rings, central disc and "bud" arising to north east side.
- fig.2. *Cyclomedusa* sp. Sprigg ($\times 0.4$). Cleavage direction clearly visible parallel with long axis of medusa.
- fig.3. *Cyclomedusa* cf. *davidi* Sprigg ($\times 0.5$)
- fig.4. *Cyclomedusa* cf. *davidi* Sprigg ($\times 0.5$) with frilling of outer ring.
- Plate 22. fig.1. *Cyclomedusa* cf. *davidi* Sprigg ($\times 0.4$). Broken specimen.
- fig.2. Medusae (?) showing three-fold budding (?) ($\times 0.5$). Blackbrook Beds.
- fig.3. Medusa showing irregular margin and some internal structure ($\times 0.5$).
- fig.4. Ovoid medusa with faint internal structure allied to *Beltanella gilesi* Sprigg ($\times 0.75$).
- Plate 23, fig.1. Specimen with long fibrous axis, small basal disc, sacs at halfway point and faint drooping branches, allied to *Arborea arborea* Glaessner & Wade, ($\times 0.5$). Woodhouse Beds.
- fig.2. "Water-lily" specimen ($\times 0.5$), *Charnia* crags, Woodhouse Beds.
- fig.3. *Charniodiscus concentricus* showing germination ? of a stipe by two buds ? ($\times 1$)
- fig.4. Two specimens of *C. concentricus* with possible associated fronds to the left of the discs ($\times 0.5$). Beacon Hill Beds.

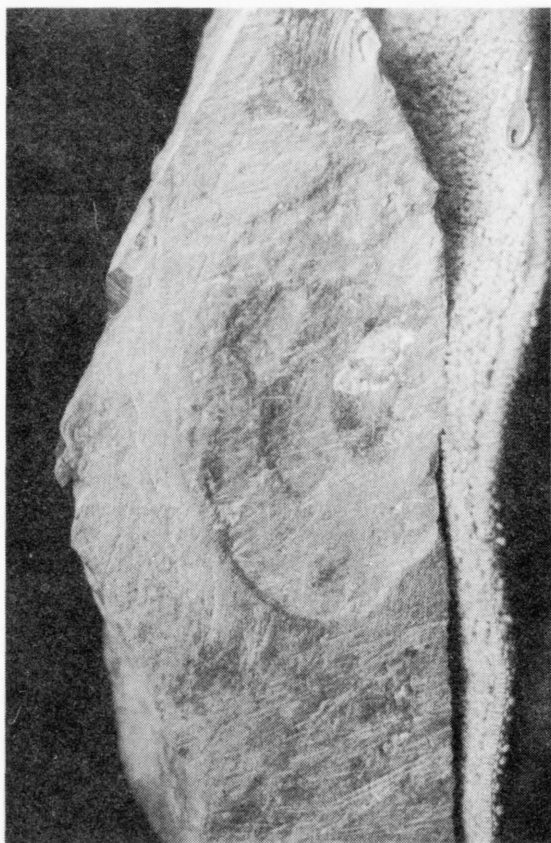
ALL PLATES - VIEW FROM RIGHT HAND MARGIN



1



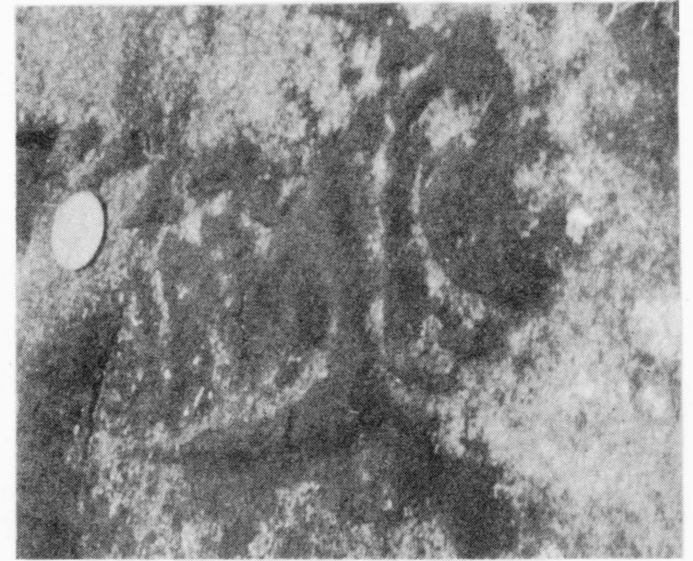
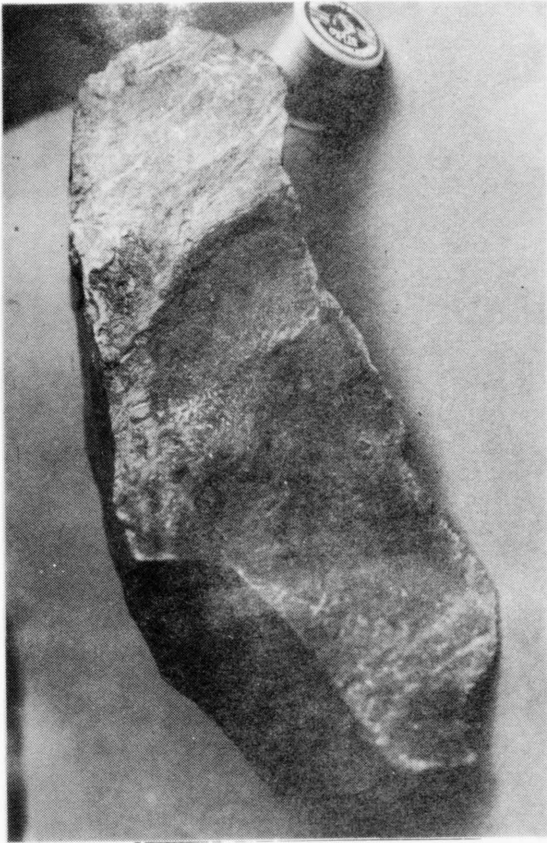
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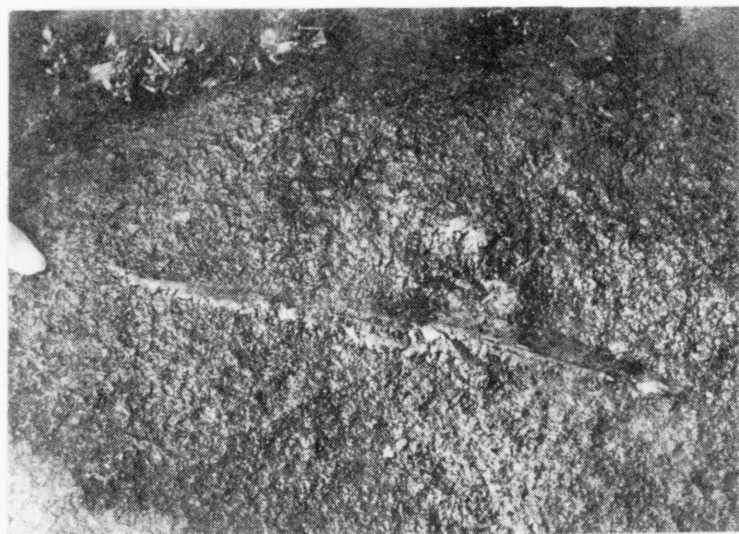


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Boynton, H. E. Charnwood Fossils.
(for explanation see p. 296)



Boynton, H. E. Charnwood Fossils.
(for explanation see p. 296)