

Palaeontological evidence of a Precambrian age of the marbles at the Asenova Krepost Castle (Central Rhodopes, Bulgaria)

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*П. В. Чумаченко, И. Г. Сапунов — Палеонтологические данные о докембрийском возрасте мраморов в районе Асеновой крепости (Центральные Родопы, Болгария). Мраморы около Асеновой крепости в Центральных Родопях находятся приблизительно в 10 км южнее Асеновграда. Они входят в литостратиграфическую единицу, сложенную из известняковых сланцев, слюдяных сланцев, мраморов и амфиболитов в альтернации. На выветрелых поверхностях мраморов наряду с многочисленными следами процессов выветривания, лишайников и пр. наблюдаются и палеонтологические объекты. В нескольких из исследованных образцах установлены экземпляры *Aspidella terranovica* Billings, 1872, *Atikokania lawsoni* Walcott, 1912 и *Chuarina* Walcott, 1899. Они распространены в докембрии Северной Америки, а третий вид присутствует и в докембрии Швеции и Советского Союза. Эти данные дают нам основание считать, что мраморы в районе Асеновой крепости также принадлежат докембрию.*

Abstract. The marbles at the Asenova Krepost Castle in the Central Rhodopes lie about 10 km to the south of the town of Asenovgrad. They belong to a lithostratigraphic unit consisting of alternating calc schists, mica schists, marbles and amphibolites. Marble surfaces have been shown to bear marks of palaeontological entities besides the numerous traces of weathering processes, lichens, etc. In several marble samples, examined in this study, specimens of *Aspidella terranovica* Billings, 1872, *Atikokania lawsoni* Walcott, 1912, and *Chuarina* Walcott, 1899, have been identified. These species occur in the Precambrian of North America, and the third one is found also in the Precambrian of Sweden and the Soviet Union. The finds are regarded as conclusive evidence of the Precambrian age of the Asenova Krepost marbles.

Introduction

General remarks on the marbles at the Asenova Krepost Castle

The marbles at the Asenova Krepost Castle lie in the valley of the Čepelarska Reka River some 10 km to the south of the town of Asenovgrad (fig. 1). In that locality they form a packet which belongs to a lithostratigraphic unit about 200-300 m thick consisting of alternating calc and mica schists, marbles and some amphibolites. The unit has been independently introduced into the formal lithostratigraphic nomenclature under two different names by Иванов et al. (1984, p. 22, fig. 8) and Кожухаров (1984, p. 70, 71, fig. 10). Иванов et al. called it Javrovo Schist Formation, and Кожухаров designated the unit as Javorovo Member of the Lukovica Gneiss-schist — Schist Formation. It is beyond our competence to enter a discussion of which of the two available names is the valid one especially as the issue lies far outside the restricted purpose of this paper. Instead, we use below the descriptive "marbles at the Asenova Krepost Castle".

Earlier ideas on the age of the marbles at the Asenova Krepost Castle and purposes of this study

The marbles at the Asenova Krepost Castle are traditionally considered Precambrian. The first direct palaeontological evidence published 10 years ago confirmed these ideas. Кожухаров, Тимофеев (1979) and later Тимофеев (1982) reported finds of Precambrian palynomorph taxa in the lower part of the marbles at the Asenova Krepost Castle and in other levels of the series introduced later by Кожухаров (1984) as the Lukovica Formation; they concluded that the rocks belong to the upper parts of the Lower Proterozoic. Besides the Precambrian age, Иванов et al. (1984, p. 33-35) considered also a younger, Paleozoic, age for the same marbles in terms of the age relationships in their Central Rhodope Metamorphic Group. In advancing this idea they declared the results of Ко̀жухаров and Тимофеев highly questionable arguing, under the strong influence of the paper of Калвачева (1982), that no microfossils could remain preserved in an epidote-amphibolite facies environment. Иванов et al. (1984) based another argument for the Central Rhodope Group Paleozoic age on finds of a hypothetical brachiopod in the Western Rhodope Mountains, referred by Анцырев et al. (1980) to the suborder Atripida (?), which have never been examined by the palaeontologists specializing in this field.

We became involved in the problems of the age of some of the Rhodope high-metamorphic complexes after the finding of presumably palaeontological entities in the marbles at the Asenova Krepost Castle in September, 1985, during a joint field tour of members of the French and Bulgarian Geological Societies. That same autumn a group headed by Ž. Ivanov gathered an impressive collection of several tens of rock samples containing structures regarded as paleontological. There was some talk even of finds of ammonites which, according to preliminary data, ascribed a Mesozoic, and even a probable Late Jurassic—Early Cretaceous age to the marbles at the Asenova Krepost Castle. That was already a challenge which we could not ignore. In February, 1986, Doc. Dr. Ivanov lent us for examination the above collection of marble samples with probable palaeontological structures. Part of the structures proved to be true palaeontological entities and they were taxonomically identified. At the end of March, 1986, we submitted to Doc. Dr. Ivanov our palaeontological-stratigraphic results in the form of a report entitled "Palaeontological evidence of the age of the Javrovo Formation in the Central Rhodope Mountains". Later, a brief summary was published by Чумаченко, Сапунов (1988).

The purpose of the present paper is to communicate our results, obtained in March 1986 and remaining unpublished for quite a long time, to wider circles of the geological community. There are no essential differences between this paper and the report of 1986. Here, however, we improved somewhat on the taxonomic identifications of some specimens introducing small corrections, and tried also to make the text generally clearer.

Acknowledgements. We are grateful to our colleague Doc. Dr. Ivanov first of all for trusting us with this study, lending us the collection of marble samples with probable macropalaeontological structures gathered from the outcrops at the Asenova Krepost Castle and instructing us in the details of field finds. We are also indebted to him for the quality photographs of part of the entities concerned without which this paper could not be prepared as intended.



Fig. 1. Location of the marbles (F) by the castle Asenova krepost

Notes on the marble samples studied

This study is based on 28 already numbered marble samples (1 to 34; we did not examine samples Nos 14, 18, 19, 20, 21, 24). The probable palaeontological structures can be observed only on the weathered surfaces of the marble samples.

Part of the samples bear marks and traces which are not palaeontological entities. These are grooves made by the weathering processes, patches of present-day lichens, etc. Samples Nos 3, 4, 6, 11, 13, 15 and 28 fall in this group. We should like to make a special note of No 4 since it was the sample which created an illusory impression of a longitudinal section of an ammonite with small umbilicus.

We were unable to identify the traces on samples Nos 7, 8, 12, 25, 29 and 30.

In the remaining 15 samples examined by us we found more or less positive evidence of palaeontological structures which we identified taxonomically. Their origin is unclear and extremely debatable. According to various authors, the three taxa identified in this study (2 species and 1 genus) represent in some cases probable body fossils or trace fossils, and in other cases they are interpreted as macroproblematica, or as pseudofossils, i. e. of inorganic origin. The various concepts on the origin of taxa found are discussed in the descriptions.

Palaeontological part

Aspidella terranovica Billings, 1872

Pl. I, fig. 1, 2; pl. II, fig. 2

1971. *Aspidella terranovica* Billings, 1872; Hofmann, p. 14, pl. 5 fig. 1, 5, 6, ?2—4 (syn. cum.).

1975. *Aspidella terranovica* Billings, 1872; Häntzschel, p. W170, fig. 102/2a-c.

Nomenclature. Cast of the holotype is illustrated by Hofmann (1971, pl. 5, fig. 1). It originates from the St. John's Formation, Newfoundland, Canada.

Description. Circular structures with tubercle-like, rounded or slightly elongated centre radiating fine ridges and grooves, vaguely discernible in the Bulgarian specimens. According to Häntzschel they are up to 3-4 cm in diameter. The specimens in this study are smaller, 1-1,5 cm. This species occurs typically in pairs consisting of a larger and a smaller specimen though specimens of similar size are also to be found in pairs. The distance between the individual specimens ranges from 3-4 mm to about 1 cm. Some specimens are elliptically elongated due presumably to tectonic deformations.

Notes. Poorly preserved small *Aspidella* could be wrongly identified as *Chuarina* (see below) but *Aspidella* are always found in pairs.

Origin. The species is interpreted as pseudofossil or macroproblematica. However, we believe it may represent a trace fossil, too.

Material. Six specimens from the marbles at the Asenova Krepost Castle (samples Nos 1, 5, 10, 22, 23, 32).

Occurrence. Precambrian of North America (Canada).

Atikokania lawsoni Walcott, 1912

1971. *Atikokania lawsoni* Walcott, 1912; Hofmann, p. 24, pl. 6, fig. 1, 2. (syn. cum.).

1975. *Atikokania lawsoni* Walcott, 1912; Häntzschel, p. W171, fig. 102/5a, b.

Description. Pear-shaped or cylindrical bodies. According to Häntzschel they reach to 3-3,5 cm in size. The Bulgarian specimens fall within this size range showing similar dimensions. They have one or two central cavities with radial canals of irregular cross sections.

Origin. The species was first referred to *Spongia*, or to *Archaeocyatha*. Some authors interpret it as pseudofossil (for details see Häntzschel, 1975, p. W 171).

Occurrence. The Precambrian of North America (Canada).

Material. Six specimens from the marbles at the Asenova Krepost Castle (samples Nos 16, 17, 26, ?27, 31). Unfortunately, the photographs available to us do not

give an adequate idea of the features of this species. Since we have not the original specimens to take better photographs we refrain from illustrating the specimens examined.

Chuar Walcott, 1899

Pl. II, fig. 1

1971. *Chuar* (Allan, 1913); Hofmann, p. 24, pl. 11, fig. 5—7.

1975. *Chuar* Walcott, 1899; Häntzschel, p. W149, fig. 6a, b (*C. circularis* Walcott, 1899), 6c, d.

Nomenclature. Type species, by monotypy, is *Chuar circularis* Walcott, 1899.

Description. Small disc-like forms resembling conical shells; concentrically wrinkled. According to Häntzschel they reach 5 mm in diameter.

Origin. The origin of this genus is interpreted in various ways: (1) biological origin: various body fossils — algae, gastropods, brachiopods, eggs of trilobites, acritarchs, megaspores, ?chitinous foraminifers, etc.; (2) inorganic origin — globular bodies of inorganic origin (pseudofossils) (for details see Häntzschel, 1975, p. W149).

Occurrence. Precambrian of North America (USA, Canada), Europe (Sweden), the USSR.

Material. Four specimens from the marbles at the Asenova Krepost Castle (samples Nos 2, 9, 26, 33).

Conclusions

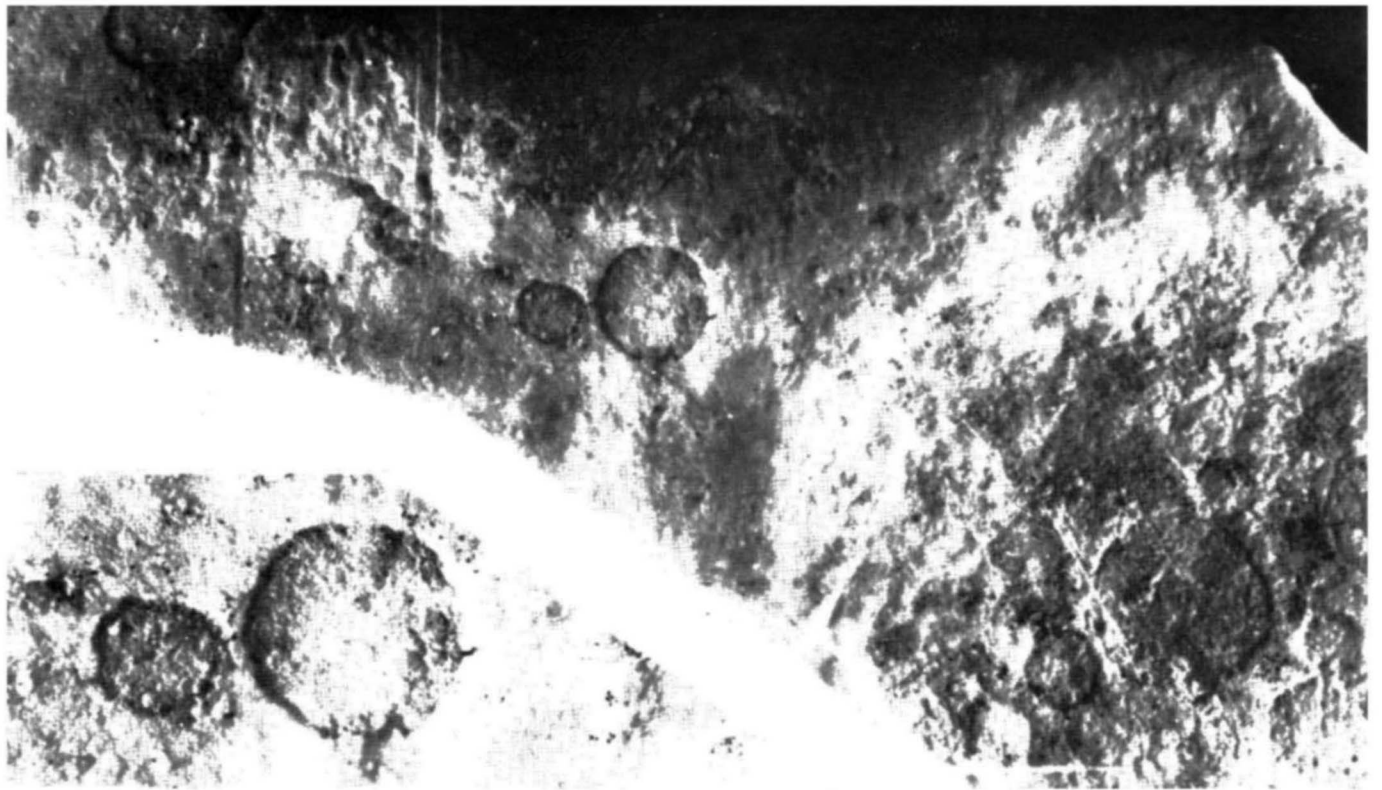
Aspidella terranovica, *Atikokania lawsoni* and *Chuar* found in the marbles at the Asenova Krepost Castle occur in the Precambrian of North America, and *Chuar* is also known from the Precambrian of the USSR and Sweden. This we consider evidence of the Precambrian age of the marbles at the Asenova Krepost Castle. The palaeontological-stratigraphic results of this study are a valid argument against the suggested Palaeozoic or Mesozoic age of these rocks. Our data agree with the palynological evidence of Кожухаров, Тимофеев (1979), Тимофеев (1982) and with the recent conclusion of Кожухаров, Тимофеев (1989) indicating that the marbles at the Asenova Krepost Castle belong to the upper part of the Lower Proterozoic.

Translated by I. Vesselinov

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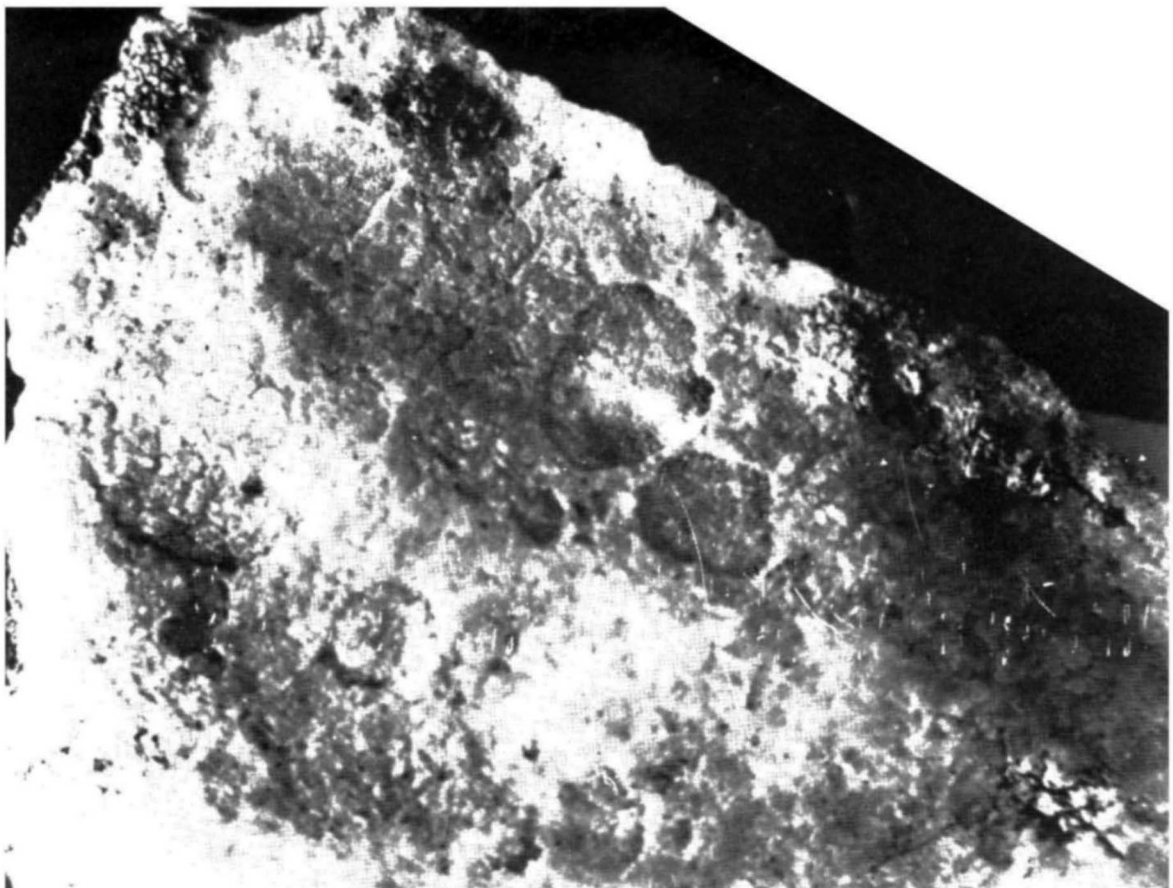
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PLATE I



1b

1 a

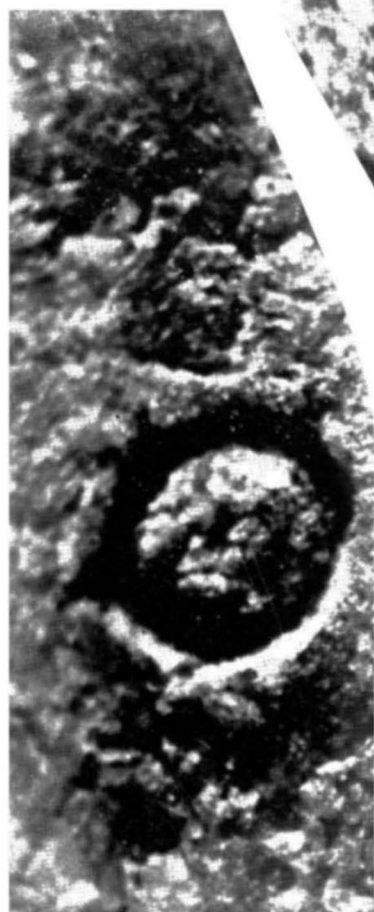


2

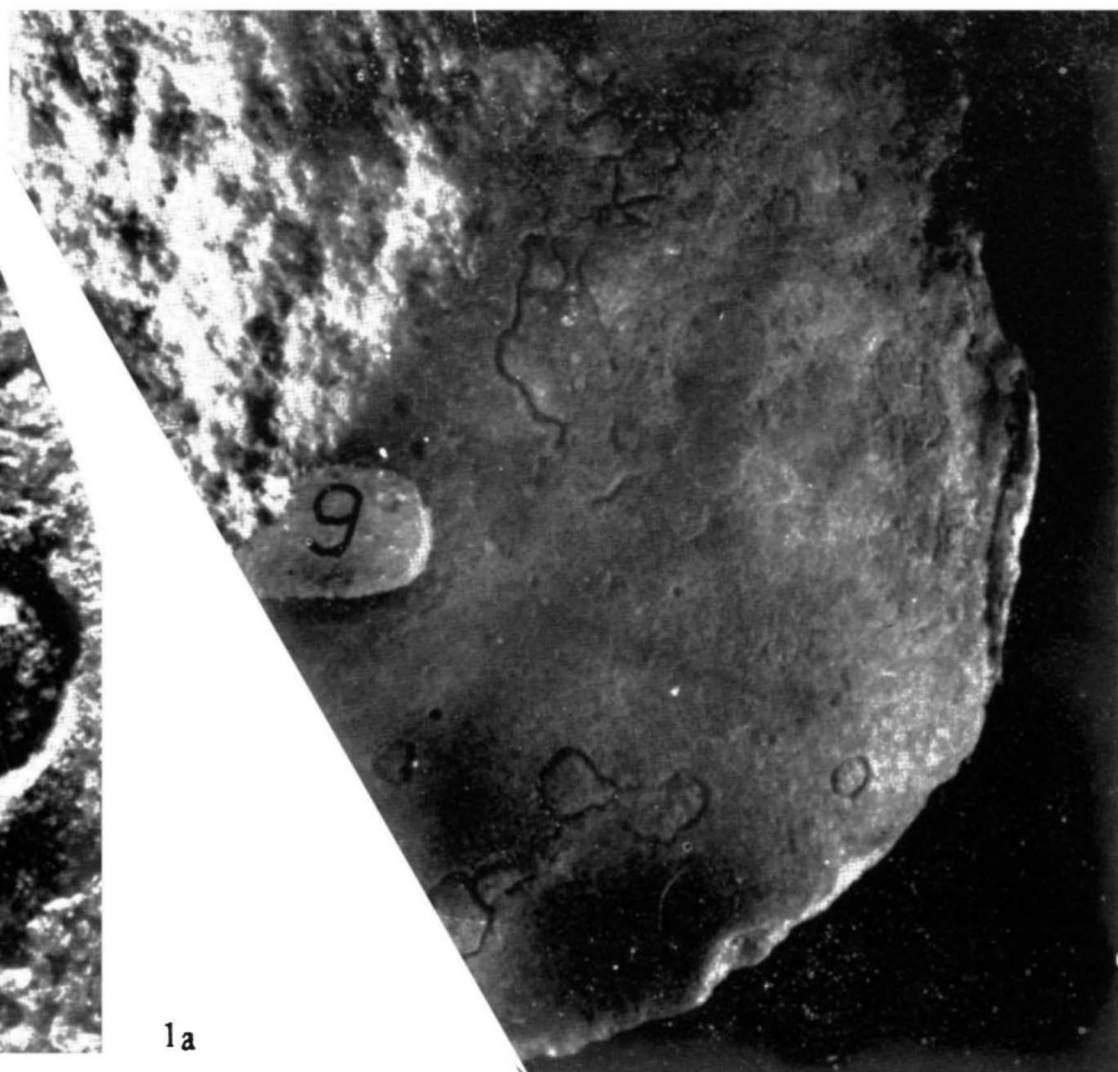
PLATE I

1a, b. Aspidella terranovica Billings, 1872. Sample No 1. From the marbles by the castle Asenova krepost, about 10 km to the south of the town of Asenovgrad; Javrovo Schist Formation according to Иванов et al. (1984) or Javorovo Member of the Lukovica Gneisschist-Schist Formation according to Кожухаров (1984); Precambrian; *1a* — $\times 1, 2$, *1b* — $\times 2, 4$

2. Aspidella terranovica Billings, 1872. Sample No 23. Ibid.; $\times 1, 7$



1a



1b



2

PLATE II

1a, b. Chuaria Walcott, 1899. Sample No 9. From the marbles by the castle Asenova krepost, about 10 km to the south of the town of Asenovgrad; Javrovo Schist Formation according to Иванов et al. (1984) or Javorovo Member of the Lukovica Gneiss-Schist Formation according to Кожухаров (1984); Precambrian; *1a* — $\times 1,0$; *1b* — $\times 8,0$

2. *Aspidella terranovica* Billings, 1872. Sample No 22. Ibid.; $\times 1,0$