Comments on Insecta of the Rhynie Chert

Roy A. Crowson

Received: 1985-03-29


In the paper by Kühne & Schlüter [1985] reference is made to a publication of my own [Crowson 1971] in which I reported having seen, in a palaeontological rock-section of Rhynie Chert in the collection of the late Prof. J. Walton, what was clearly a nymph of a species of Thysanoptera, representing the more advanced group Tubulifera. The authors cite this as evidence for the occurrence of higher Pterygota in the Lower Devonian period; otherwise, the oldest known fossils of winged insects date from the late Namurian, and they comprise only primitive types, widely unlike any taxa now living. The oldest Thysanoptera known in the fossil record are from Permian deposits in the USSR [Martynova 1962], and appear to represent very primitive types, certainly not of Tubulifera.

Kühne & Schlüter accept without question, as most other palaeontologists have done, the described Collembola [Rhyniella Hirst & Maulik 1926] and Acarina [Protacarus Hirst 1923] of the Rhynie Chert as genuine Devonian fossils. My reasons [loc. cit.] for doubting this were not fully stated in the publication cited. They are, firstly, that both Rhyniella and Protacarus appear to be very similar structurally to dominant and widespread modern representatives of their groups, whereas all the larger fossils of the Rhynie Chert, whether plants [Rhynia, Hornea, Asteroxylon] or Arthropoda [Palaeocharinus Hirst 1922, Lepidocarps Scourfield 1926] belong to extinct groups, markedly different from any modern types. Secondly, there is the mode of preservation of these fossils. In the figured more or less complete specimens of Rhyniella, the abdomen appears much shrivelled, indicating that the specimens have become desiccated before they were embedded — a very rare phenomenon in fossil insects. In Protacarus, the specimens appear to be remarkably well preserved, with numerous body setae in place.

Thirdly, there is the nature of Rhynie Chert matrix. It is composed of colloidal, not crystalline, silica, which has become very hard and brittle, and in its natural state is permeated by numerous more or less fine cracks. Ground-living Collembola and Acarina very often take refuge in cracks and crevices in rocks. There is evidence elsewhere (e.g. in the flints of the Cretaceous chalk) that silica may be later dissolved and redeposited in a colloidal state, though little seems to be known of the conditions in which this is likely to occur. If there has been, in later geological time, solution and redeposition of the silica in the Rhynie Chert by liquids permeating the cracks, this might lead to the embedding of small animals which had penetrated these cracks. Whalley & Jarzembowski [1981], after restudy of rock sections containing specimens of Rhyniella, reported that they were unable to find any evident discontinuity in the matrix around Rhyniella fossils as compared with adjacent areas containing Devonian fossil plants. However, this does not necessarily prove that, as they asserted, the matrix "represented a single phase of mineral growth". A colloid does not "grow" in the manner of normal crystalline minerals, it gelatinises from a liquid, like the "setting" of a jelly, and usually forms an optically homogeneous matrix.

The best test of the hypothesis here advanced would be study of conditions in which the Rhynie Chert matrix could be liquefied (or converted into a sol), and the attempt to