Origin of Fossil 'Zoophycos'

In the Czechoslovak Carpathians I have found imprints, described in the literature from many localities throughout the world as *Zoophycos, Taonurus, Spirophyton*, etc. The occurrence of these imprints in numerous localities in the Czechoslovak Carpathians is closely related to fine-grained sandstone strata, and sometimes to the marlstones (Cretaceous, Palaeogene). After a detailed investigation I concluded that these imprints were formed by abandoned prostomial parts (gill organs) of sedentary marine worms (Annelida, Polychaeta) from the family Sabellidae[1]. The imprints are closely similar to the recent genus *Spirographis Viviani* 1805. As in that genus, the gill rays of the fossil worms are spirally wound around an asymmetrical gill lobe either to the left or to the right side, in the ratio of about 1:1. In sedimentary rocks the gill organs are either perpendicular to the bedding plane or they form flat coinciding accumulations.

The gill organs (prostomium) which are the forepart of the body are easily abandoned by the worms when they are in danger[2]. Abandoned gill organs were formerly considered by palaeontologists as unknown, extinct plants, most probably algae or as a breeding place of marine animals, so that these fossils were regarded for a long time as problematical in origin. They are common in

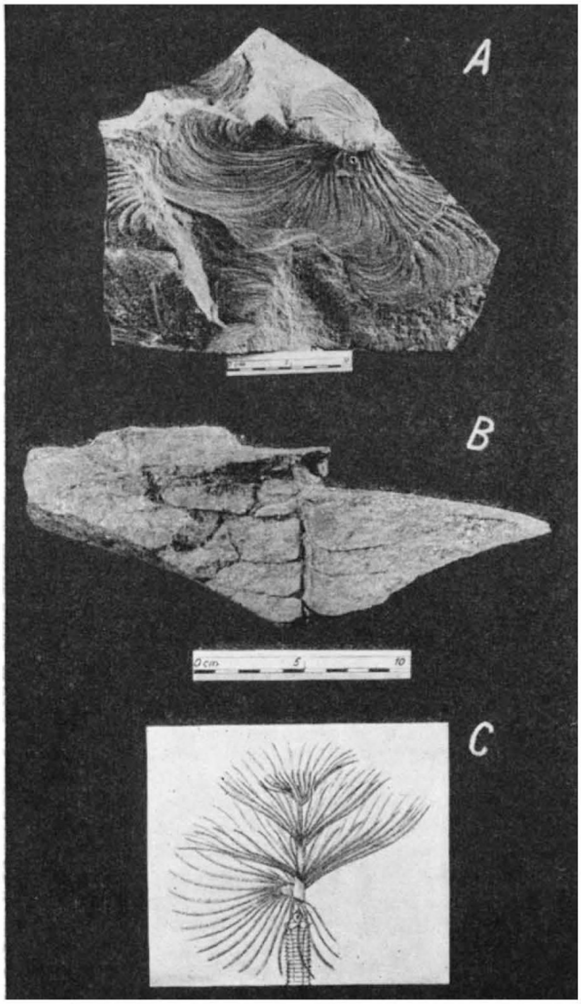

Fig. 1. *A, Zoophycos*; the imprint of the lower floor of branchial filaments when observed from above. The Carpathian flysch, Eocene, sample No. 33120*B*–5/1, photo Z. Šerebl. *B, Zoophycos*; the imprint of prostomial lobe with branchial filaments when observed from one side (longitudinal section). The Carpathian flysch, Palaeocene, sample No. 3497*C*–1/1, photo Z. Šerebl. *C, Spirographis spallanzanii Viviani*; the prostomial lobe with branchial filaments when observed from one side (A. Lameere[14])

Africa[3,4], America[5,6], France[7], Germany[8], England[9], Switzerland[7], Belgium[8,9], Luxembourg[8], Italy[10], Austria[11], Poland[12], Czechoslovakia[1], and the U.S.S.R.[13], and their occurrence may be recorded anywhere in shallow-water marine sediments all over the world.

Fossil worms lived in a siphuncle as sedentary animals in colonies on the bottom of a shallow sea and, like recent forms, they fed on fine detritus and micro-organisms sinking downwards to the bottom. They received the food by means of their gill organs with variously adapted gill rays. On account of the different shape of the gill rays in fossils from the Flysch of the Czechoslovak Carpathians I proposed several genera. In that area, where these fossils occur in the rocks, a very rapid sedimentation may be supposed.

Due to their systematic classification in the animal kingdom they have become the most common fossils in the stratigraphic as well as in the topographic sense and they ought to have been referred to the zoological system long ago.

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METALLURGY

Dispersion-softened Zinc Alloys

A number of zinc-based alloys containing equiaxed particles of various stable and insoluble hard second phases were prepared as part of an investigation into the high-temperature compression creep characteristics of dispersion-hardened materials[1]. It was found that the dispersed particles produced a substantial strengthening effect at temperatures above 0·60 of the absolute melting temperature of zinc. Room-temperature tensile tests were made in order to measure the expected loss in ductility of zinc caused by the hard particles. It was surprising to find, therefore, that most of the dispersed particles reduced the strength and increased the ductility of zinc. These results are briefly reviewed here.

The alloys were prepared by methods of powder metallurgy in order to produce uniform dispersions of ZnO, αAl_2O_3, carbon black, and tungsten in a void-free zinc matrix. The particle size of these spheroidal dispersoids was typically 0·1–0·6μ. Two concentrations of second-phase particles were studied: 9 and 15 volume per cent. The composites were obtained in the form of 0·375-in.-diameter extruded rods. Specimens were annealed before testing at 385° C for 24 h. Pure zinc extrusions were also prepared from the same lot of powder as the composites and these were used to establish a basis for comparison.

Typical true stress versus true strain curves are presented in Fig. 1 for a zinc–tungsten alloy and also for a pure-zinc specimen. There are three characteristics to be noted from these curves and from the results in general: (1) The dispersed particles of tungsten actually weaken the metal. It can be seen that both the stress at the onset of plastic flow and the ultimate strength were lower for the composite than for the pure zinc. (2) The particles produced strain softening in zinc. That is, after a period of work-hardening, the effective stress required to deform