

Fig. 1. Detailed structure of a single lung-book (scale 0.5 mm.)

and Trigonotarbita. These he has reasonably interpreted as representing the stigmata of lung-books. However, there seem to be no records of definite lung-book structure in any fossil.

The fine structure of lung-books may only be expected in fossils from deposits formed under exceptionally favourable conditions of preservation. Such a deposit is the Rhynie Chert (Scottish Middle Old Red Sandstone). Remarkably well preserved Arachnids attributed to the family Palaeocharinidae, recently placed in the order Trigonotarbita by Petrunkevitch<sup>1,2</sup>, have been described by Hirst<sup>3</sup>, who was able to give full descriptions of external features but made no mention of lung-books or their stigmata.

During a re-investigation of the plants of the chert carried out by one of us (A. G. L.), numbers of these Arachnids have been encountered together with the plants among which they lie. Thin serial sections have been made by means of the palaeobotanical peel method, after etching with hydrofluoric acid. Some of these sections show clear evidence of lung-book structure (Figs. 1 and 2), resembling very closely the comparable organs of modern spiders. Longitudinal sections show the presence of two pairs apparently opening by small stigmata on the sternites of the first and second opisthosomal segments (Fig. 2). With this and further sectioned material it should be possible to make detailed reconstructions and identifications.

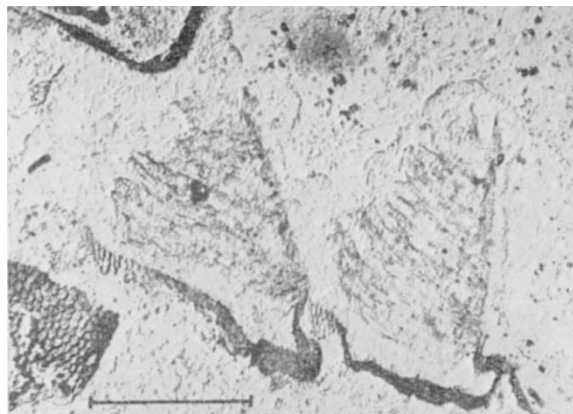


Fig. 2. Longitudinal section of successive lung-books and stigmata (scale, 0.1 mm.)

The Palaeocharinidae have been recorded only from the Rhynie Chert and are of particular interest since they are among the earliest terrestrial Arachnida known with any certainty, and because they show a number of important similarities to the Araneida. To the latter can now be added the presence of two pairs of lung-books.

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<sup>1</sup> Petrunkevitch, A., *Trans. Connecticut Acad. Arts Sci.*, **37**, 69 (1949).

<sup>2</sup> Petrunkevitch, A., *Mem. Geol. Soc. Amer.*, **53** (1953).

<sup>3</sup> Petrunkevitch, A., in *Treatise on Invertebrate Palaeontology* (edit. by Moore, R. C.), *P. Arthropoda*, 2 (Kansas, 1955).

<sup>4</sup> Hirst, S., *Ann. Mag. Nat. Hist.* (9), **12**, 455 (1923).

## CHEMISTRY

### Complex Compounds of Zero-valent Platinum

RECENTLY, Chopoorian, Lewis and Nyholm<sup>1</sup> have indicated that the triphenylphosphine complexes of platinum(0) described by Malatesta and Cariello<sup>2</sup> are hydrides  $[\text{PtH}_2(\text{PPh}_3)_n]$  ( $n = 2, 3$  or  $4$ ), and question the existence of any platinum(0) complexes. Some years ago we prepared a compound  $[\text{Pt}(\text{Ph}_2\text{PCH}_2\text{CH}_2\text{PPh}_2)_2]$ . We have now examined it very carefully and conclude that it is indeed a complex of zero-valent platinum.

It is precipitated during the vigorous reaction which ensues on the addition of concentrated aqueous sodium borohydride solution to a hot ethanol/water (8 per cent) solution of  $[\text{Pt}(\text{Ph}_2\text{PCH}_2\text{CH}_2\text{PPh}_2)_2]\text{Cl}_2$ , and crystallizes from benzene/methanol in golden yellow plates, m.p. 252–255°, in an evacuated tube. It is a non-electrolyte of very low dipole moment, and oxidized only very slowly by air. The infra-red and nuclear magnetic resonance spectra show no sign of Pt—H bonds or hydridic hydrogen. On oxidation in benzene solution with an excess of iodine (3 mol.) and extraction with water no acidity is developed, as it would were the complex a hydrido-complex.

With Dr. H. R. Watson's assistance we have also obtained a purely aliphatic analogue  $[\text{Pt}(\text{Me}_2\text{PCH}_2\text{CH}_2\text{PMe}_2)_2]$  by the reduction of the corresponding dipositive cation with sodium naphthalenide ( $\text{NaC}_{10}\text{H}_8$ ) in tetrahydrofuran<sup>3</sup>. It is a colourless substance highly sensitive to air.

It is presumed that both these  $d^{10}$  complexes will have a tetrahedral configuration, corresponding to that of nickel carbonyl.

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<sup>1</sup> Chopoorian, J. A., Lewis, J., and Nyholm, R. S., *Nature*, **190**, 528 (1961).

<sup>2</sup> Malatesta, L., and Cariello, Miss C., *J. Chem. Soc.*, 2323 (1958).

<sup>3</sup> Chatt, J., and Watson, H. R., *Nature*, **189**, 1003 (1961).