A NEW BRITISH PERMIAN SPORE

by W. G. CHALONER and R. F. A. CLARKE

ABSTRACT. A new fossil miospore, *Vittatina hiltonensis* sp. nov., is described from the Hilton Plant Bed (Upper Permian), and compared with other Permian multistriate spores.

IN the course of a study of the spores from the Hilton Plant Bed (Zechstein, Upper Permian) of Westmorland, England, a new species has been found which may be assigned to the pollen genus *Vittatina* Luber. These spores were prepared by maceration of the shale of the Plant Bed with cold hydrofluoric acid, followed by concentration by flotation in bromoform. Single spore mounts in glycerine jelly were made between coverslips so that the spores could be examined under oil immersion from both sides; the spores illustrated here were mounted in this way.

Genus VITTATINA (? Luber 1940) Samoilovich 1953

There appears to be some uncertainty as to whether this genus was adequately validated by Luber in 1940; Potonié (1958, p. 90) was evidently unable to confirm publication of a valid type species at that date. We have been unable to trace the relevant work of Luber (see Samoilovich 1953, Potonié 1958), but accept Potonié's view that Luber may be regarded as author of the generic name. However, it remains uncertain whether the genus *Vittatina* was satisfactorily validated before Samoilovich's (1953) publication (undoubtedly valid) of the species *V. subsaccata*. The genus has since been used consistently by other authors (e.g. Potonié, Wilson) and we accordingly accept it in this sense.

Vittatina hiltonensis sp. nov.

Plate 80, figs. 5–11; text-fig. 1A, B

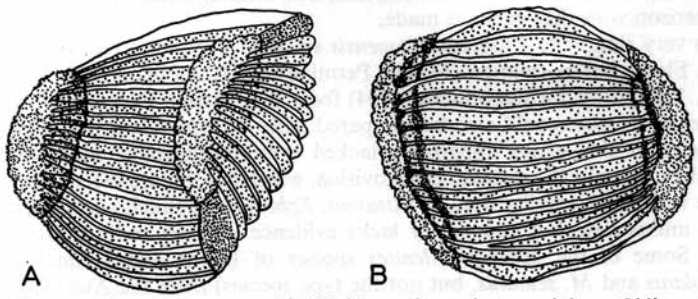
Diagnosis. Spores bilateral as seen in polar view; long equatorial axis (Z in text-fig. 2), including the rudimentary sacci, 38–65 μ, mean of six specimens 55 μ; short equatorial axis (W in text-fig. 2) 32–45 μ, mean of six specimens 39 μ. Entire proximal face of spore, excluding the rudimentary sacci, covered by thickened exinous elongations (ridges or muri) parallel with the long equatorial axis, and separated by relatively narrow furrows or striae, there being 15–18 ridges across the width of the proximal face. Each ridge typically has a maximum width of 2 μ, the furrows between being typically 0·5 μ wide. Exinous ridges semicircular in profile (seen on a folded edge), converging and narrowing towards the short sides of the spore as seen in polar view. They may be somewhat displaced, or twisted locally, or even die out; they do not appear to anastomose and are apparently restricted to the proximal face. In the two regions of convergence of the striations, exine locally cavate, producing features here referred to as rudimentary sacci, which show an obscure stippled pattern (seen at the right in Plate 80, fig. 7). Rudimentary sacci somewhat offset distally, so extending farther over the distal than the proximal surface (text-fig. 2, C and D). Rudimentary

[Palaeontology, Vol. 4, Part 4, 1961, pp. 648–52, pl. 80.]

sacci, seen in a flattened spore, 23 μ long (X, text-fig. 2) by 7 μ wide (Y, text-fig. 2), means of four measurements.

Holotype. Plate 80, figs. 5–7; Hilton Plant Bed, Hilton Beck, near Appleby, Westmorland, England. Geological Survey and Museum, London, slide number Mik (C) 514.

Discussion. In the fossil state the pollen has generally collapsed completely so that the proximal and distal faces of the grain are in contact. In all the specimens examined the



TEXT-FIG. 1, *Vittatina hiltonensis* sp. nov. ×1,000 (drawn from photographs). A, Oblique polar view showing the form and extent of the thickened exinous bands and their relationship to the sacci. On the extreme left the striations are viewed distally through the saccus. The right-hand end shows the proximal striated surface folded over the smooth distal surface, and the extent of the thickened bands (see Plate 80, figs. 5–7). B, Polar view of an unfolded specimen with smaller sacci; the striations are again viewed through the distal surface (see Plate 80, figs. 10–11).

flattening is such that the spores are oriented with the polar axis more or less vertical. The whole grain may be somewhat curved so that the rudimentary sacci are frequently seen on edge (Plate 80, fig. 11, left-hand side) or are folded back over the grain (left-hand side of Plate 80, figs. 5–7) or seen in profile at the margin (Plate 80, fig. 6, right-hand side).

The sacci in the genus *Vittatina*, as illustrated by Samoilovich, are relatively very small, as compared with those of living *Pinus*, for example. Samoilovich refers to this state as 'subsaccate'. We describe these features as rudimentary sacci, without implying by this that we regard these features as representing phylogenetic precursors of true sacci. There seems to be no evidence either that this is the case, or (as is suggested by the term 'vestigial sacci' of some authors) that these structures are derived phylogenetically from an originally saccate state.

Comparison with other Permian Bilateral Multistriate Spores. The spores here assigned to *Vittatina hiltonensis* sp. nov. may be compared with the several genera of bisaccate multistriate spores which are such a characteristic feature of Permian assemblages in many areas. They show closest similarity to *Vittatina* Luber and *Protosacculina* Malavkina 1953. The type species of *Protosacculina*, *P. glabrescens* Malavkina, has relatively large sacci, equal to about half the bulk of the spore body, in contrast to the minute sacci shown by *Vittatina* as interpreted by Samoilovich. For this reason we assign our spore to *Vittatina*. Hart (1960) has taken a rather different interpretation of *Protosacculina*, and erects a new species of that genus which, he concedes, is closely similar (e.g. in its small sacci) to species included by other authors in *Vittatina*.

Our species, *Vittatina hiltonensis* sp. nov., is clearly similar to *V. subsaccata* Samoilovich, but differs from it in the longer sacci (our dimension X, text-fig. 2) and occasional anastomoses of the thickened bands in the latter species. Samoilovich's figure suggests anastomosis of the bands of thickening, but the possibility that this is an artefact produced by buckling of the proximal face cannot be ruled out. Our species can also be compared with *Protodiploxypinus bullaeformis* (? nom. nud.) Samoilovich 1953; this is illustrated but not described by Samoilovich, and although clearly similar to *Vittatina*, no comparison with that genus is made.

Spores very similar to *Vittatina hiltonensis* sp. nov. were reported by Wilson (1959) from the Flowerpot Formation (Middle Permian) of Oklahoma (cf. his '*Vittatina* sp.', pl. 1, fig. 15) and by Tschigouriaeva (1954) from the Russian Permian (cf. her fig. 14). *V. hiltonensis* sp. nov. could also be compared with *Welwitschiapites* Bolchovitina; the type species of this genus apparently lacked even rudimentary sacci, and is more *Ephedra*-like. Even in *W. alekhinii* Bolchovitina, which has minute saccus-like structures, these are very much smaller than in *Vittatina*. *Ephedripites* Bolchovitina is comparable in being multistriate but completely lacks evidence of even rudimentary saccus-like features. Some of the *Marsupipollenites* species of Balme and Hennelly 1956 (e.g. *M. fasciolatus* and *M. scutatus*, but not the type species) from the Australian Permian, are clearly similar to our species. Balme has already suggested (personal communication to W. G. C. Nov. 1957) that some of his multistriate species of *Marsupipollenites* might be better included in *Vittatina* rather than in the former genus. Alpern (1958) has described spores apparently similar to *V. hiltonensis* sp. nov., from the French Autunian, as *Aumancisporites*. Although he compares his spores to *Vittatina*, Alpern does not regard them as saccate, and apparently on this basis erects the new genus.

COMPARISON WITH *CLASSOPOLLIS BELLOYENSIS* POCOCK AND JANSONIUS 1961

Pocock and Jansonius (1961) have recently revised the genus *Classopollis* and described a new Permian species, *C. belloyensis*. They record this species from the Permian

---

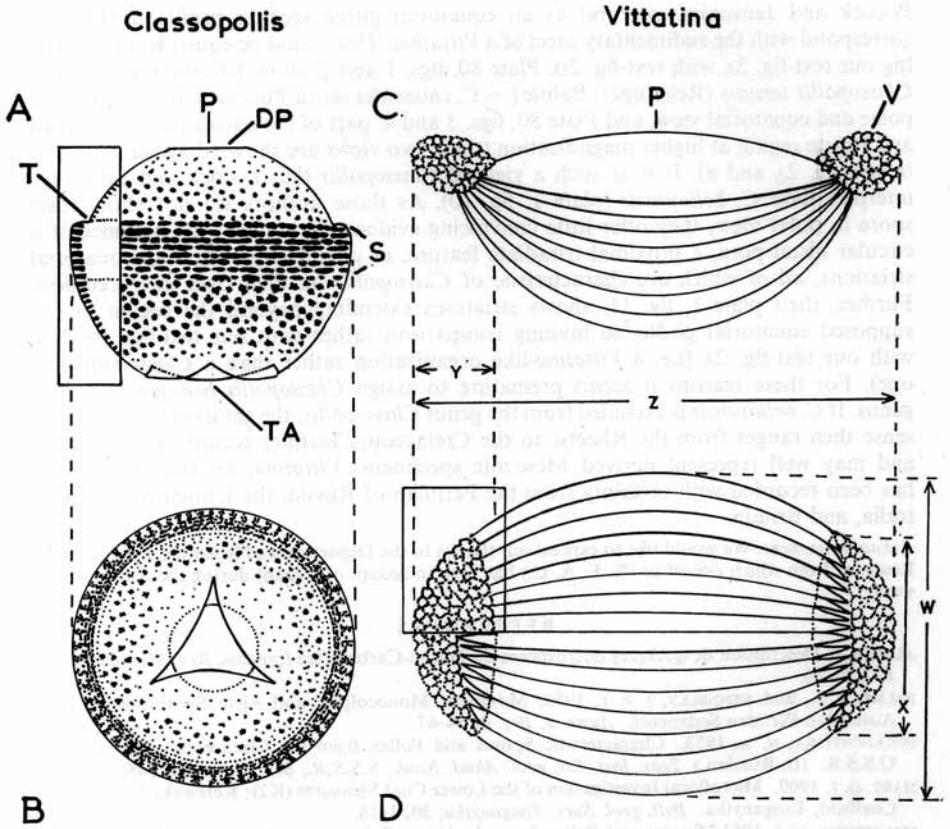
EXPLANATION OF PLATE 80

Magnification: figs. 3 and 4, ×2,000. Remainder, ×1,000.

Figs. 1–4, *Classopollis torosus* (Reissinger) Balme, Rhaetic. 1, Polar view, showing triangular proximal aperture, thin sub-equatorial zone encircling it, and wall structure (Henfield borehole, Sussex). 2, Equatorial view of another specimen; 3, the same, showing the thickened equatorial zone in profile; 4, the same at higher focal plane, showing equatorial striations at centre (Foxholes No. 2 borehole, Owthorpe, Nottinghamshire).

Figs. 5–11, *Vittatina hiltonensis* sp. nov. from the Hilton Plant Bed, Upper Permian. 5–7, Oblique polar view of distal face, in successively higher focal planes. The striations are on the proximal face, and are seen through the smooth distal face. Rudimentary saccus at right (seen most clearly at 7). At left, the proximal face is folded over the distal, and shows the extent of the thickened bands on the proximal side of the saccus. 8–9, Another specimen with rather less prominent rudimentary sacci; the higher focal plane is at 8 (the proximal striations are seen through the distal face). 10–11, Another specimen in polar view, in two focal planes. Note irregularities in the continuity of the thickened bands. The rudimentary saccus is seen in sharp focus at right, in 11.

All preparations in the Geological Survey and Museum, London; fig. 1: Mik(C) 314; figs. 2–4: Mik(J) 304; figs. 5–7: Mik(C) 514; figs. 8–9: Mik(C) 512; figs. 10–11: Mik(C) 513.



TEXT-FIG. 2. Diagrammatic reconstructions of *Classopollis torosus* (Reissinger) Balme (A, B) and *Vittatina hiltonensis* sp. nov. (C, D), ×1,000. Above, equatorial views; below, polar views. The rectangle in A shows the spore wall in section; that in D shows the distal view of the rudimentary saccus, the remainder of the drawing showing the proximal view. P, polar axis; D.P., distal pore; S, equatorial striations; T, thin-walled subequatorial zone; T.A., triradiate aperture (proximal); V, rudimentary saccus; W, X, Y, Z, dimensions referred to in the text.

of both Canada and the Hilton Plant Bed, Westmorland. While we accept the general interpretation of *Classopollis* proposed by those authors on the basis of the type species, we believe that their Permian spore lacks sufficient diagnostic characters of that genus to be included in it. A comparison of Pocock and Jansonius's figures of *Classopollis belloyensis* with *Vittatina hiltonensis* suggests the possibility that their species might represent a spore of comparable organization to *Vittatina* rather than *Classopollis*. If this were so, their figure would correspond with a polar view of a *Vittatina*-like subsaccate striate pollen grain, rather than an equatorial view of a *Classopollis*. The features which

Pocock and Jansonius interpret as an equatorial girdle seen in profile might then correspond with the rudimentary sacci of a *Vittatina*. This would be equivalent to equating our text-fig. 2A with text-fig. 2D. Plate 80, figs. 1 and 2, show Rhaetic specimens of *Classopollis torosus* (Reissinger) Balme (= *C. classoides* sensu Pocock and Jansonius) in polar and equatorial view, and Plate 80, figs. 3 and 4, part of the equatorially thickened and striate region at higher magnification (these two views are shown diagrammatically in text-fig. 2A and B). It is as such a view of *Classopollis* that Pocock and Jansonius interpret their *C. belloyensis* (plate 1, fig. 10). As those authors do not show their spore in polar view, they offer little convincing evidence to support the presence of a circular distal pore, a proximal triradiate feature, or completely encircling equatorial striations, all of which are characteristic of *Classopollis* on their own interpretation. Further, their plate 1, fig. 11, shows striations extending beyond the region of the supposed equatorial girdle, so inviting comparison rather with our text-fig. 2D than with our text-fig. 2A (i.e. a *Vittatina*-like organization rather than a *Classopollis*-like one). For these reasons it seems premature to assign *Classopollis belloyensis* to this genus. If *C. belloyensis* is excluded from the genus *Classopollis*, the genus in this restricted sense then ranges from the Rhaetic to the Cretaceous. Tertiary records are uncertain and may well represent derived Mesozoic specimens. *Vittatina*, on the other hand, has been recorded with certainty from the Permian of Russia, the United States, Australia, and Britain.

Acknowledgement. We would like to express our thanks to the Department of Scientific and Industrial Research from which one of us (R. F. A. C.) has been in receipt of a grant during the course of this work.

REFERENCES

ALPERN, B. Description de quelques microspores du Permo-Carbonifère français. *Rev. Micropalaeont.*, **1**, 2, 75-86.

BALME, B. E., and HENNELLY, J. P. F. 1956. Monolete, Monocolpate and Alete Sporomorphs from Australian Permian Sediments. *Austr. J. Bot.* **4**, 54–67.

BOLKHOVITINA, N. A. 1953. Characteristic Spores and Pollen from the Cretaceous of the Central U.S.S.R. (In Russian.) *Trav. Inst. Sci. geol. Akad. Nauk, S.S.S.R.*, Ser. geol. **(61), 145,** 1–184.

HART, G. F. 1960. Microfloral Investigation of the Lower Coal Measures (K2); Ketewaka-Mchuchuma Coalfield, Tanganyika. *Bull. geol. Surv. Tanganyika*, **30**, 1–18.

MALAVKINA, V. S. 1953. Spores and Pollen from the Upper Triassic and Lower and Middle Jurassic from the East and West Pre-Urals. (In Russian.) *Trav. Inst. Petrol.-Geol. S.S.S.R.*, N.S., **75,** 93–147.

POCOCK, S. J., and JANSONIUS, J. 1961. The Pollen Genus *Classopollis* Pflug 1953. *Micropaleontology*, **7** (4), 439-49.

POTONIÉ, R. 1958. Synopsis der Gattungen der Sporae dispersae, Teil II. *Beih. Geol. Jb.* **31,** 1–114.

SAMOILOVICH, S. R. 1953. Pollen and Spores from the Permian Deposits of the Cherdyn' and Aktyubinsk areas, Cis-Urals. (In Russian.) *Trav. Inst. Petrol.-Geol., S.S.S.R.*, N.S., **75,** 5–57.

—— 1961. (English translation of the above), *Okla. Geol. Surv., Circ.* **56,** 1–103.

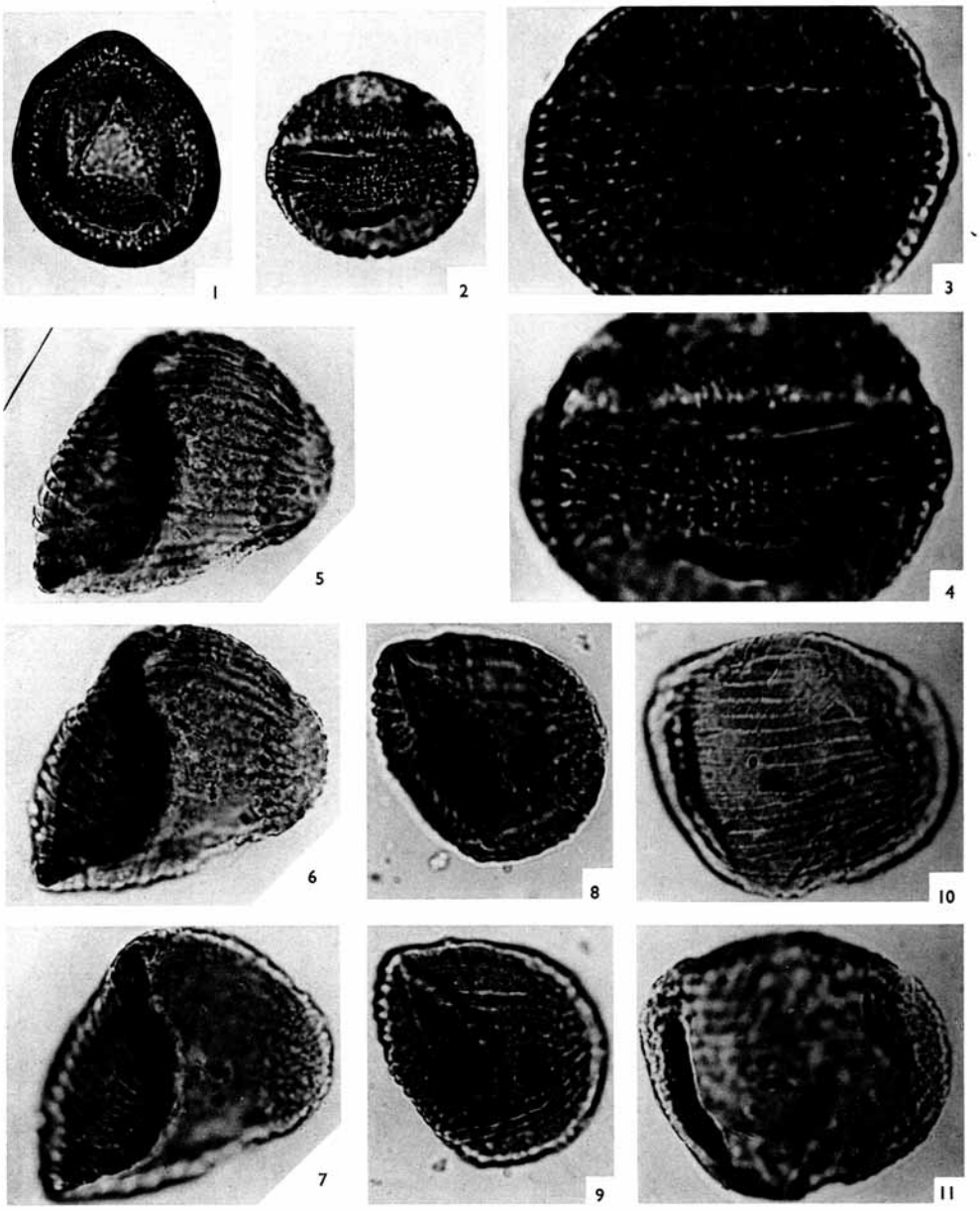
TCHIGOURIAEVA, A. A. 1954. Structure du pollen des Gnétales. *Grana Palynologica*, **1,** 95–98.

WILSON, L. R. 1959. Geological History of the Gnetales. *Okla. geol. Notes*, **19,** 35–40.

W. G. CHALONER
Botany Department,
University College

R. F. A. CLARKE
Geology Department,
University College,
London

Manuscript received 26 April 1961



CHALONER and CLARKE, Permian miospores