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MIOSPORES IN GIVETIAN TO LOWER FRASNIAN SEDIMENTS DATED BY CONODONTS FROM THE BOULONNAIS, FRANCE

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ABSTRACT

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The Calcaire de Blacourt and the lower part of the Schistes de Beaulieu exposed in the new railroad trench Caffiers—Ferques and in the Griset Quarry (Boulonnais, France) contain well-preserved miospore assemblages which have been previously described from continental beds in Scotland, Spitsbergen and the Canadian Arctic Islands.

Their distribution is presented in relation to a conodont zonation, ranging from the *Icriodus obliquimarginatus* Zone to the lower *Polygnathus asymmetricus* Zone, and allows accurate correlations with the type sections of Givet and Frasnes in Belgium where several optimal horizons could be selected to fix the Givetian/Frasnian (Middle—Upper Devonian) boundary.

INTRODUCTION

The Devonian sequence in the Boulonnais outcrops near Ferques between Calais and Boulogne in the most northern area of France. This area is part of a western extension of the Namur synclinorium. The 1/50,000 geological map of Marquise (Bonte et al., 1971) gives the following succession from the base to the top:

(1) The Middle Devonian Poudingue de Caffiers, Grès et Schistes de Caffiers with *Aneurophyton germanicum* (Corsin, 1933) and Calcaire de Blacourt with *Stringocephalus burtini*.

(2) The Upper Devonian Schistes de Beaulieu, Calcaire de Ferques, Schistes d'Hydrequent and Grès et Psammites de Fiennes ou de Sainte Godeleine. Taugourdeau-Lantz (1960, 1967a, b and 1971) has described Frasnian miospores from this area. Most of her material belongs to the Schistes de Beaulieu, Calcaire de Ferques and Schistes d'Hydrequent exposed in the Tarstinkal quarries.

However, Taugourdeau-Lantz (1967a, 1971) also mentions five spore

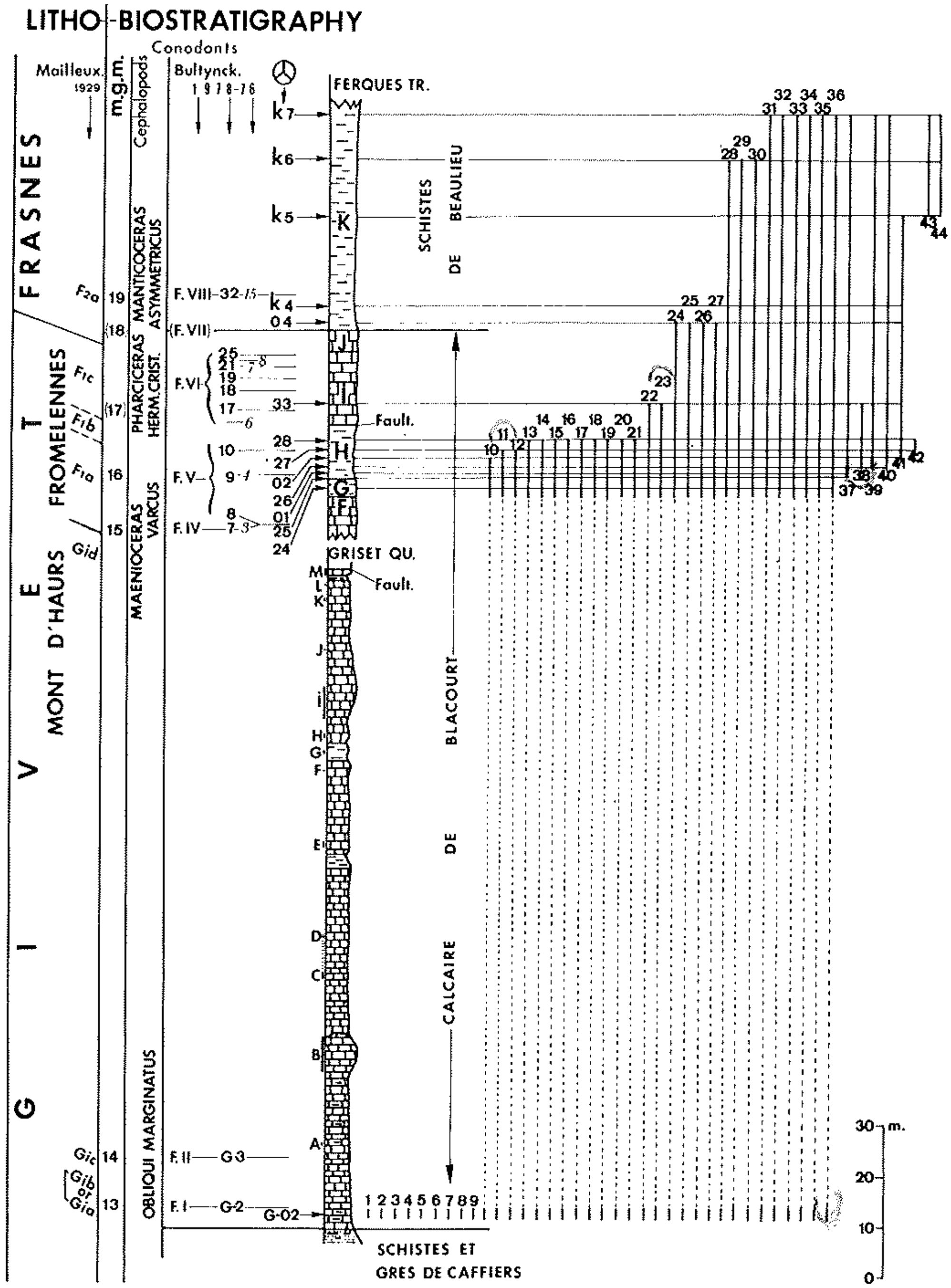

LITHO-BIOSTRATIGRAPHY
Conodonts
Mailleux. 1929
m.g.m.
Cephalopods
Bultynck. 1978-76
FERQUES TR.
GIVET
FRASNES
FROMELENNES
MONT D'HAURS
MANTICOCERAS ASYMMETRICUS
PHARCICERAS HERM.CRIST.
MAENIOCERAS VARCUS
OBLIQUI MARGINATUS
SCHISTES DE BEAULIEU
CALCAIRE DE BLACOURT
Fault.
GRISET QU.
SCHISTES ET GRES DE CAFFIERS
F. VIII-32-15
(F. VII)
F. VI
F. V
F. IV
F. II — G3
F. I — G2
G-02
30 m.
20
10
0

Fig.1. Lithological column composed from Brice et al. (1976, 1977); *m.g.m.* = micropaleontological guiding mark (Namur symposium excursion guidebook, edited by Bouckaert and Streel, 1974).

1 = *Aneurospora* cf. *heterodonta* (Naumova) Streel 1972 (Plate II, 5).
2 = *Archaeozonotriletes variabilis* (Naumova) Allen 1965 (Plate II, 14).
3 = *Brochotriletes* sp. (Plate II, 3).
4 = *Convolutispora disparalis* Allen 1965 (Plate I, 7).
5 = *Convolutispora paraverracuta* McGregor 1964 (Plate I, 6).
6 = *Dibolisporites* cf. *gibberosus* (Naumova) Richardson 1965 (Plate I, 9).
7 = *Grandispora douglastownense* McGregor 1973 (Plate III, 8).
8 = *Rhabdosporites langii* (Eisenack) Richardson 1960 (Plate III, 2).
9 = *Verruciretusispora pallida* (McGregor) Owens 1971 (Plate I, 5).
10 = *Acanthotriletes* cf. *horridus* Hacquebard 1957 *sensu* Richardson 1965.
11 = *Aneurospora goensis* Streel 1964 (Plate II, 7).
12 = *Contagisporites optivus* var. *vorobjevensis* (Chibrikova) Owens 1971 (Plate III, 1)
13 = *Ancyrospora ancyrea* var. *ancyrea* Richardson 1962 (Plate IV, 7).
14 = *Ancyrospora ancyrea* var. *brevispinosa* Richardson 1962 (Plate IV, 6).
15 = *Ancyrospora loganii* McGregor 1973 (Plate IV, 5).
16 = *Auroraspora macromanifesta* (Hacquebard) Richardson 1960.
17 = *Auroraspora micromanifesta* (Hacquebard) Richardson 1960 (Plate IV, 1).
18 = *Bullatisporites bullatus* Allen 1965 (Plate I, 11).
19 = *Cirratriradites dissutus* Allen 1965 (Plate II, 10).
20 = *Cymbosporites* cf. *cyathus* Allen 1965 (Plate II, 15).
21 = *Grandispora inculta* Allen 1965 (Plate III, 7) (Syn.: *Endosporites globosus* Taugourdeau-Lantz 1967b).
22 = *Grandispora velata* (Eisenack) McGregor 1973 (Plate III, 4).
23 = *Samarisporites inaequus* (McGregor) Owens 1971 (Plate II, 13).
24 = *Aneurospora greggsi* (McGregor) Streel in Becker et al. 1974 (Plate II, 6).
25 = *Biornatispora reticulata* Lele et Streel 1969 (Plate II, 2).
26 = *Verrucosisporites premnus* Richardson 1965 (Plate I, 3).
27 = *Verrucosisporites cf. uncatus* (Naumova) Richardson 1965 (Plate I, 2).
28 = *Dibolisporites echinaceus* (Eisenack) Richardson 1965 (Plate I, 12).
29 = *Emphanisporites* spp.
30 = *Retusotriletes rugulatus* Riegel 1973 (Plate I, 1).
31 = *Ancyrospora langii* (Taugourdeau-Lantz) Allen 1965 (Plate IV, 4).
32 = *Grandispora tomentosa* Taugourdeau-Lantz 1967b (Plate III, 5,6).
33 = *Hystricosporites* spp.
34 = *Perotrilites ergatus* Allen 1965 (Plate IV, 2).
35 = *Rhabdosporites parvulus* Richardson 1965 (Plate III, 3).
36 = *Samarisporites triangulatus* Allen 1965 (Plate II, 11,12) (Syn.: *S. euglyphus* Taugourdeau-Lantz 1967b).
37 = *Ancyrospora angulata* Tiwari et Schaarschmidt 1975 (Plate IV, 3).
38 = *Chelinospora concinna* Allen 1965 (Plate II, 16).
39 = *Cirratriradites jekhowskyi* Taugourdeau-Lantz 1967b (Plate II, 9).
40 = *Geminospora lemurata* Balme 1962 (Plate II, 8) (Syn.: *G. maculata* Taugourdeau-Lantz 1967b).
41 = *Dibolisporites* sp. cf. *Lophotriletes atratus* Naumova *sensu* Streel in Becker et al. 1974 (Plate I, 8).
42 = *Corystisporites multispinosus* Richardson 1965 (Plate I, 10).
43 = *Convolutispora* cf. *subtilis* Owens 1971.
44 = *Verrucosisporites* cf. *grandis* McGregor 1960, *non* (Naumova) Richardson 1965 (Plate I, 4).

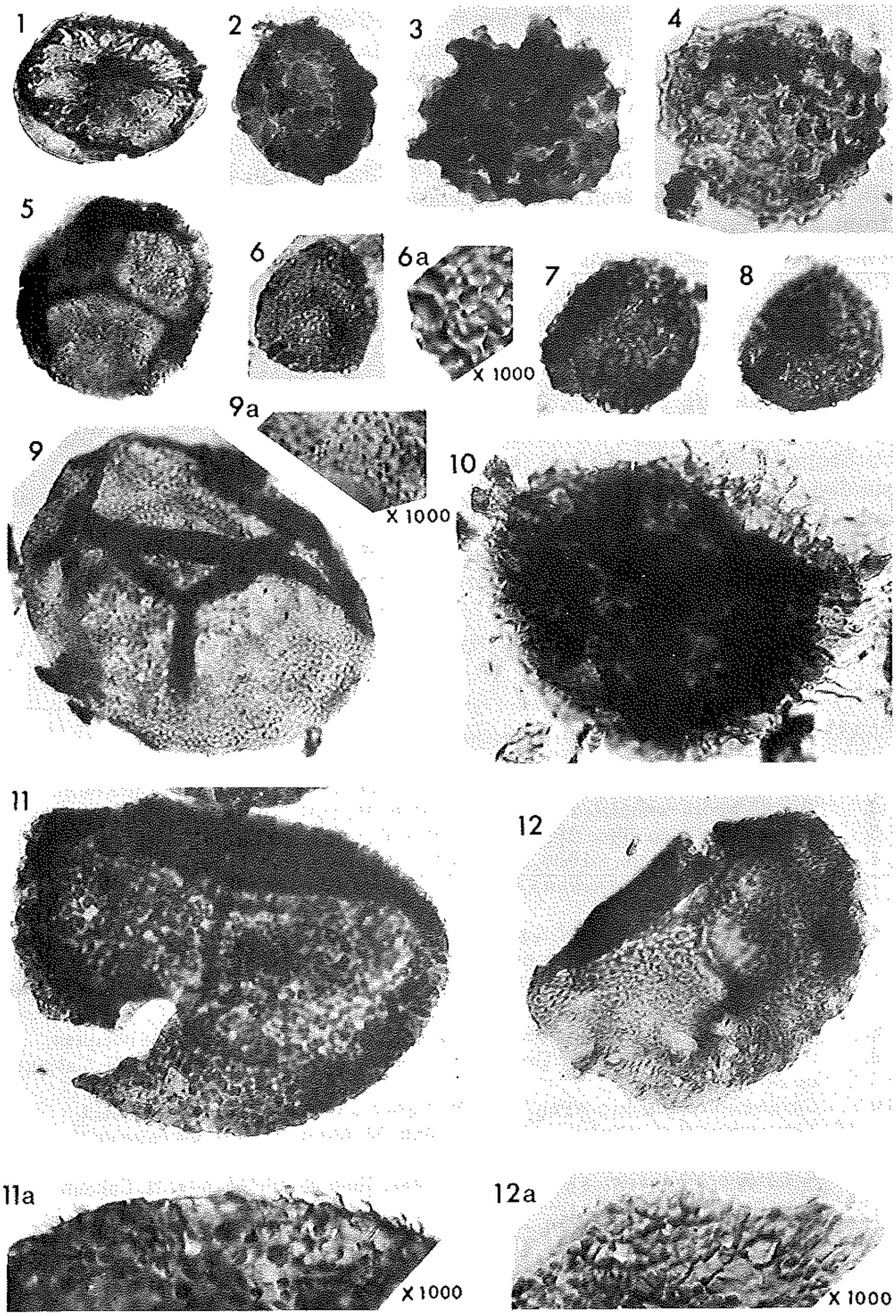
species occurring in the Calcaire de Blacourt from three samples that she collected in an otherwise unlocated "Calcaire bleu dur" of the Griset quarry. These are *Anapiculatisporites atrebates* Taugourdeau-Lantz, *Endosporites globosus* Taugourdeau-Lantz, *Samarisporites inaequus* (McGregor) Owens, *Ancyrospora langii* (Taugourdeau-Lantz) Allen and *Punctatisporites duplex* Taugourdeau-Lantz. Another sample (No. 597), coming from the Banc Noir quarry, has *Ancyrospora langii* as well, but also contains *Hystricosporites strigosus* Taugourdeau-Lantz, *Geminospora maculata* Taugourdeau-Lantz and *Rhabdosporites cuvillieri* Taugourdeau-Lantz. The age of this sample was regarded as (Early?) Givetian (Taugourdeau-Lantz, 1971, p.20) or Early Frasnian (Taugourdeau-Lantz, 1971, table 1). Most of the "Lower Frasnian" Schistes de Beaulieu investigated were core-drill samples in the Tarstinkal quarries with no mention about their exact stratigraphical position regarding the base of these beds. Therefore the delineation of the Givetian/Frasnian boundary using miospores obviously could not be attempted with this material. This was shown also the correlation chart provided by Streel (1972, fig.1).

More recently a new railroad section near Ferques (Brice et al., 1976) has shown the Calcaire de Blacourt and the Schistes de Beaulieu outcropping in succession, with a fairly rich faunal documentation. This section is here palynologically investigated as well as samples collected throughout the Calcaire de Blacourt in the Griset quarry.

PLATE I (All photographs × 500, except where otherwise stated)

1. *Retusotriletes rugulatus* Riegel. Slide 28, 17/19, level H, Calcaire de Blacourt.
2. *Verrucosisporites* cf. *uncatus* Naumova. Slide 27, 06/95, level H, Calcaire de Blacourt.
3. *Verrucosisporites premnus* Richardson. Slide 2E, 26/91, level A, Calcaire de Blacourt.
4. *Verrucosisporites* cf. *grandis* McGregor. Slide K5—2, 15/52, level K, Schistes de Beaulieu.
5. *Verruciretusispora pallida* (McGregor) Owens. Slide 2J, 11/78, level A, Calcaire de Blacourt.
6. *Convolutispora paraverrucata* McGregor. Slide 2I, 29/41, level A, Calcaire de Blacourt. 6a. Detail of 6, × 1000.
7. *Convolutispora disparalis* Allen. Slide 2I, 28/09, level A, Calcaire de Blacourt.
8. *Dibolisporites* sp. cf. *Lophotriletes atratus* Naumova. Slide K5—1, 27/02, level K, Schistes de Beaulieu.
9. *Dibolisporites* cf. *gibberosus* (Naumova) Richardson. Slide 2K, 29/94, level A, Calcaire de Blacourt. 9a. Detail of 9, × 1000.
10. *Corystisporites multispinosus* Richardson. Slide 27, 16/56, level H, Calcaire de Blacourt.
11. *Bullatisporites bullatus* Allen. Slide 26D, 21/00, level H, Calcaire de Blacourt. 11a. Detail of 11, × 1000.
12. *Dibolisporites echinaceus* (Eisenack) Richardson. Slide 2F, 18/17, level A, Calcaire de Blacourt. 12a. Detail of 12, × 1000.

PLATE I



FAUNAL EVIDENCE

The railroad section near Ferques is located and described by Brice et al. (1976, 1977, 1978, 1979) who also summarize the faunal evidence. The succession of conodont faunas provides the most accurate bio-stratigraphical framework available in that section. These data are here condensed in the upper part of Fig.1 where our sampling numbers are compared to Bultynck's 1976 and 1978 sampling numbers (in Brice et al., 1976, 1977). Most of the productive spore samples are associated with conodont faunas ranging from the *varcus* to the *asymmetricus* zones. These conodont zones are known (Bultynck, 1975) in the Fromelennes Formation (upper part of the Calcaire de Givet, Errera et al., 1972), a key lithological unit in the Ardennes for delimiting the Givetian/Frasnian boundary. This boundary (and consequently the Middle/Upper Devonian boundary) has received several different definitions.

(1) The boundary given in the Prodrome (Fourmarier, 1954) and in the Lexique Stratigraphique International (Waterlot, 1957) is below the "Assise de Fromelennes". This formed the base for code letters for the Frasnian subdivisions (F1a, etc.; Mailleux and Demanet, 1929) which obviously are of a more lithological than bio-chronological nature and therefore should be abandoned. To define this boundary, Bultynck (1975, and in Brice et al., 1976, 1979) has used the evolutionary characters of two groups of conodont species. The successive incoming of *Icriodus* gr. *eslaensis-brevis* and *I. latecarinatus* on the one hand and of *Polygnathus pseudofoliatus* and *P. denis-*

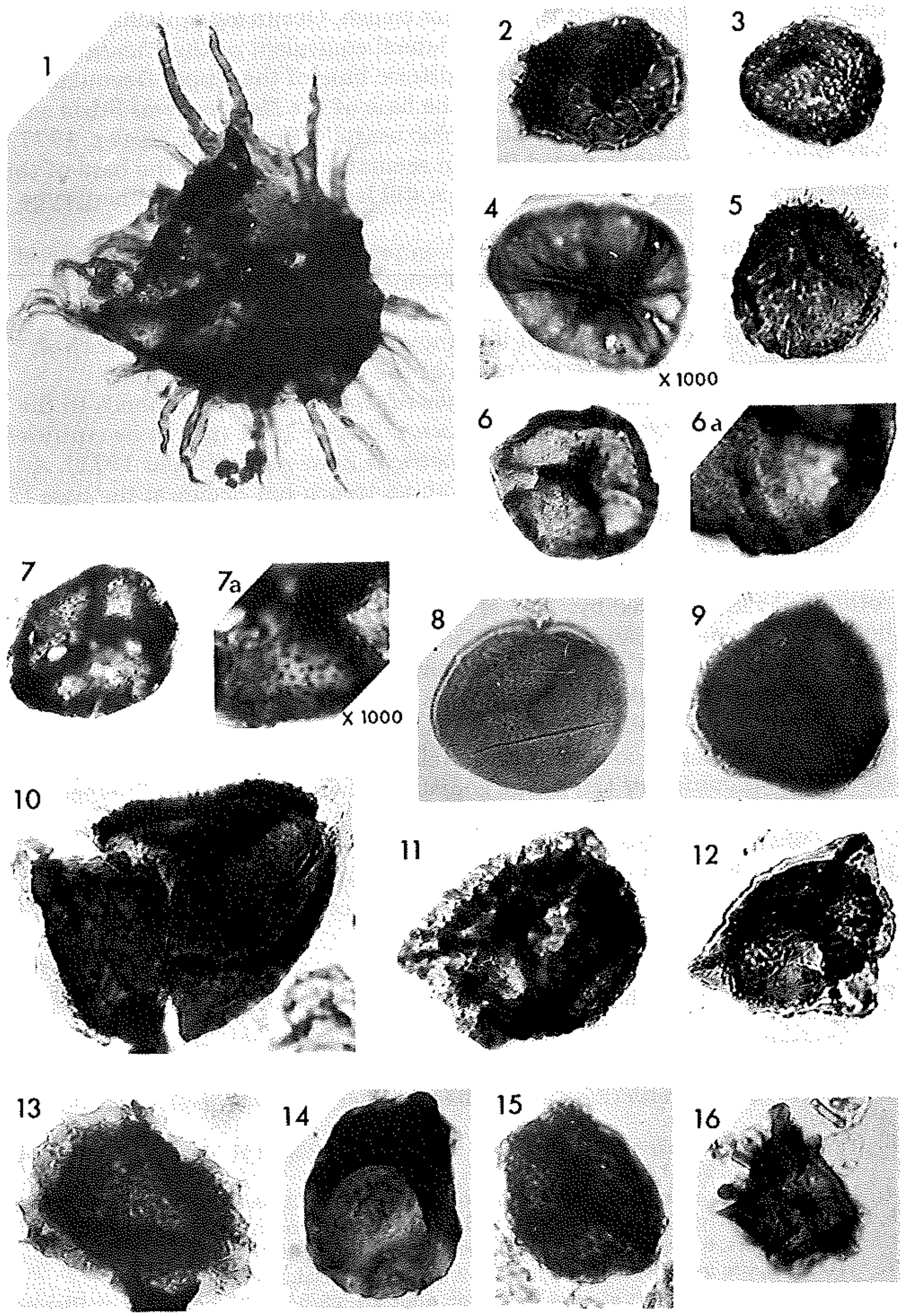
PLATE II (All photographs × 500, except where otherwise stated)

1. *Hystricosporites corystus* Richardson. Slide 2A, 21/14, level A, Calcaire de Blacourt.
2. *Biornatispora reticulata* Lele et Streel. Slide 02, 10/77, level H, Calcaire de Blacourt.
3. *Brochotriletes* sp. Slide 2B, 28/66, level H, Calcaire de Blacourt.
4. *Emphanisporites* sp., × 1000. Slide 04B, 17/15, level K. Schistes de Beaulieu.
5. *Aneurospora* cf. *heterodonta* (Naumova) Streel. Slide 2E, 15/57, level A, Calcaire de Blacourt.
6. *Aneurospora greggsii* (McGregor) Streel. Slide 27A, 28/17, level H, Calcaire de Blacourt. 6a. Detail of 6, × 1000.
7. *Aneurospora goensis* Streel. Slide 2F, 23/77, level A, Calcaire de Blacourt. 7a Detail of 7, x 1000.
8. *Geminospora lemurata* Balme. Slide 04A, 23/46, level K, Schistes de Beaulieu.
9. *Cirratriradites jekhowskyi* Taugourdeau-Lantz. Slide 04B, 04/95, level H, Calcaire de Blacourt.
10. *Cirratriradites dissutus* Allen. Slide 28, 13/02, level H, Calcaire de Blacourt.

11, 12. *Samarisporites triangulatus* Allen. 11. Slide 2J, 08/50, level H, Calcaire de Blacourt. 12. Slide 27, 08/83, level H, Calcaire de Blacourt.

13. *Samarisporites inaequus* (McGregor) Owens. Slide 26, 09/31, level H, Calcaire de Blacourt.
14. *Archeozonotriletes variabilis* (Naumova) Allen. Slide 2F, 29/32, level A, Calcaire de Blacourt.
15. *Cymbosporites* cf. *cyathus* Allen. Slide 28, 15/24, level H, Calcaire de Blacourt.
16. *Chelinospora concinna* Allen. Slide 01, 23/91, level H, Calcaire de Blacourt.

PLATE II



briceae on the other, define a useful limit between faunas IV and V within a few meters of the lowest part of the Fromelennes Formation as well as in the basal layers of unit H of the Ferques trench. Occurring probably in the late *varcus* Zone, this limit could be a lateral equivalent of the *Pharciceras lunulicostata* (Iα) base which is "the historic base of the Upper Devonian for German stratigraphers and forms the base of the *Manticoceras* Stufe and of the Adorfian in its chronostratigraphic usage" (House and Ziegler, 1977, p. 92). However, it must be noted that an accurate definition of the base of this goniatite zone in terms of conodonts, is still lacking in the Martenberg type section.

(2) Two possible boundaries have been proposed (Bultynck, 1975; Streel et al., 1975) very near the top of the Fromelennes Formation (top of the Calcaire de Givet):

(a) A boundary at the base of the *Ancyrodella* biozone, starting with *A. binodosa* found in the lowermost part of the unit "F2a" in Belgium (Mouravieff, 1970). The first occurrence of *Ancyrodella* corresponds to the base of the lower *asymmetricus* Zone *sensu* Ziegler 1971 (not to be confused with the base of the lowermost *asymmetricus* Zone *sensu* Ziegler 1971). *A. binodosa* has not been found in the Ferques trench but occurs at the base of the Schistes de Beaulieu in the Banc Noir and Griset quarries (Faune VII of P. Bultynck, pers. comm.).

(b) A boundary drawn a few meters higher at the transition *A. binodosa/A. rotundiloba* as proposed by Coen (1973, p.243) and which might have a better phylogenetical support. The Fauna VIII with transitional specimens between *binodosa* and *rotundiloba* occurs a few metres higher than the base of the Schistes de Beulieu in the Ferques trench (Brice et al., 1976).

Both boundaries which have a rather clear definition in terms of conodonts, appear to correlate with levels before the incoming of *Manticoceras cordatum* (Iβ) of the goniatite zonation. However, the second limit is probably nearer the base of Iβ than the first one.

(3) Other possibilities, based on conodonts for a Middle/Upper Devonian boundary within the Fromelennes Formation time equivalent, will not be considered here. Characterized by the first occurrences of either *Schmidtognathus*

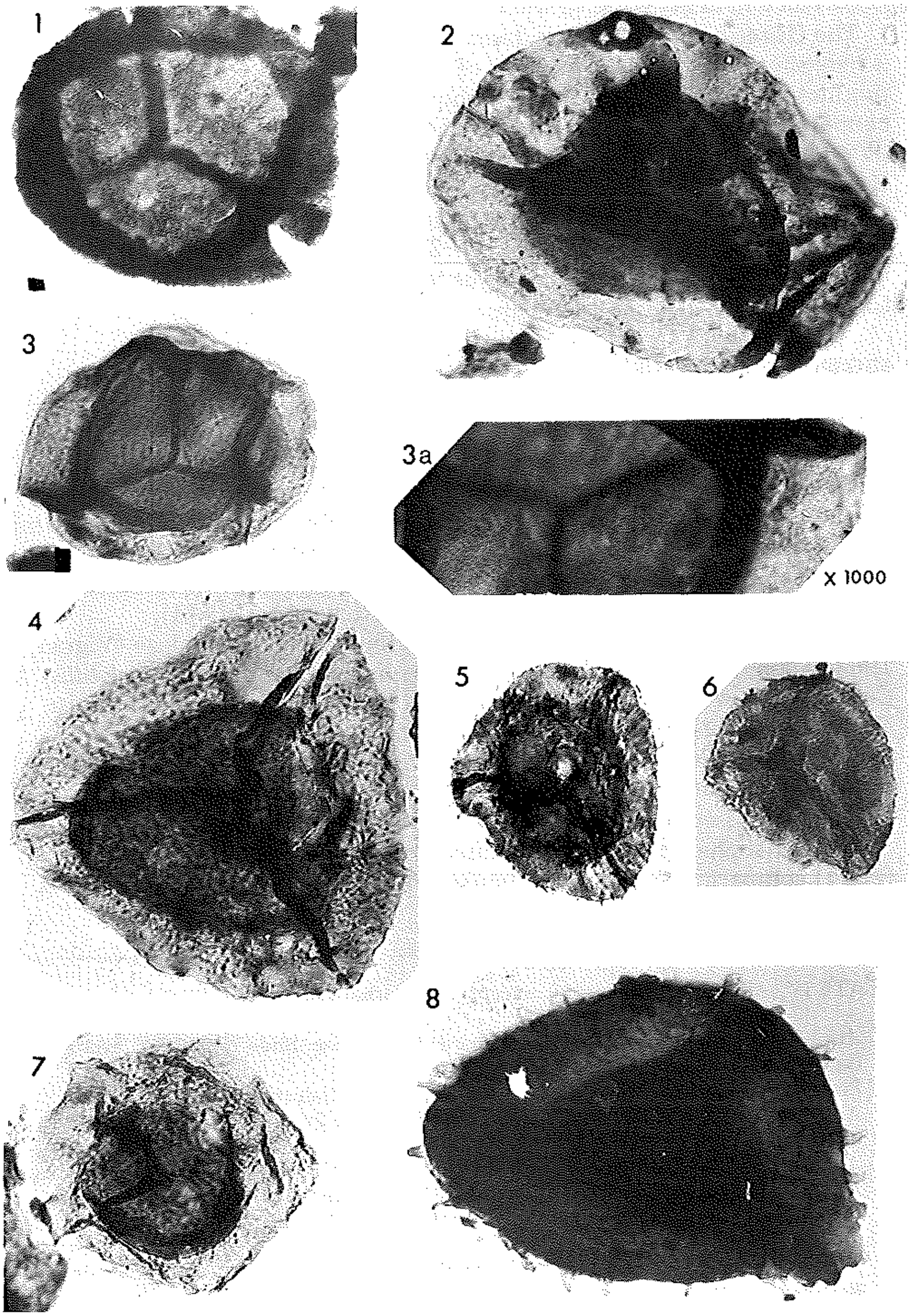
PLATE III (All photographs × 500, except where otherwise stated)

1. *Contagisporites optivus* var. *vorobjevensis* (Chibrikova) Owens. Slide 2B, 11/21, level A, Calcaire de Blacourt.
2. *Rhabdosporites langii* (Eisenack) Richardson. Slide 2F, 24/56, level A, Calcaire de Blacourt.
3. *Rhabdosporites parvulus* Richardson. Slide 26, 19/41, level H, Calcaire de Blacourt. 3a. Detail of 3, × 1000.
4. *Grandispora velata* (Eisenack) McGregor. Slide 01, 10/22, level H, Calcaire de Blacourt.

5, 6. *Grandispora tomentosa* Taugourdeau-Lantz. 5. Single mount 26.03, level H, Calcaire de Blacourt. 6. Slide 25A, 12/34, Level H, Calcaire de Blacourt.

7. *Grandispora inculta* Allen. Slide 02, 09/91, level H, Calcaire de Blacourt.
8. *Grandispora douglastownense* McGregor. Slide 2H, 26/65, level A, Calcaire de Blacourt.

PLATE III



hermanni (Ziegler, 1971) or *Spathognathodus insitus*, a possible ancestor of *A. binodosa* (Bultynck, 1975), they have the same disadvantage of an erratic occurrence in many parts of the world, including the Boulonnais area.

The Griset quarry section is described by Brice et al. (1977). The lithology is here simplified in the lower part of Fig.1, where the position of the only productive spore sample (G—02) is shown immediately below the productive conodont samples (G—2 and G—3). These last samples belong to the *Icriodus obliquimarginatus* Zone, a typical Givetian biostratigraphical unit. Sample G—3 contains *I. eslaensis* which occurs in the Gic lithological unit of the Givet type section (P. Bultynck, pers. comm., and in Brice et al., 1978a, 1979). The succession of faunas I (G—2) and II (G—3) in the basal layers of the Calcaire de Blacourt enables us to correlate them with a late Early to early Middle Givetian timespan.

MIOSPORES EVIDENCE

The whole assemblage containing 44 miospore species is listed in the legend to Fig.1. The assemblage is characterized throughout by the occurrence of *Samarisporites triangulatus* and *Ancyrospora langii*. Also characteristic, but much more restricted in distribution, are *Contagisporites optivus* var. *vorobjensis* and *Archaeozonotriletes variabilis*. These miospores obviously represent the *triangulatus* assemblage described by Allen (1965, 1967, 1973) and more recently retained by Richardson (1974).

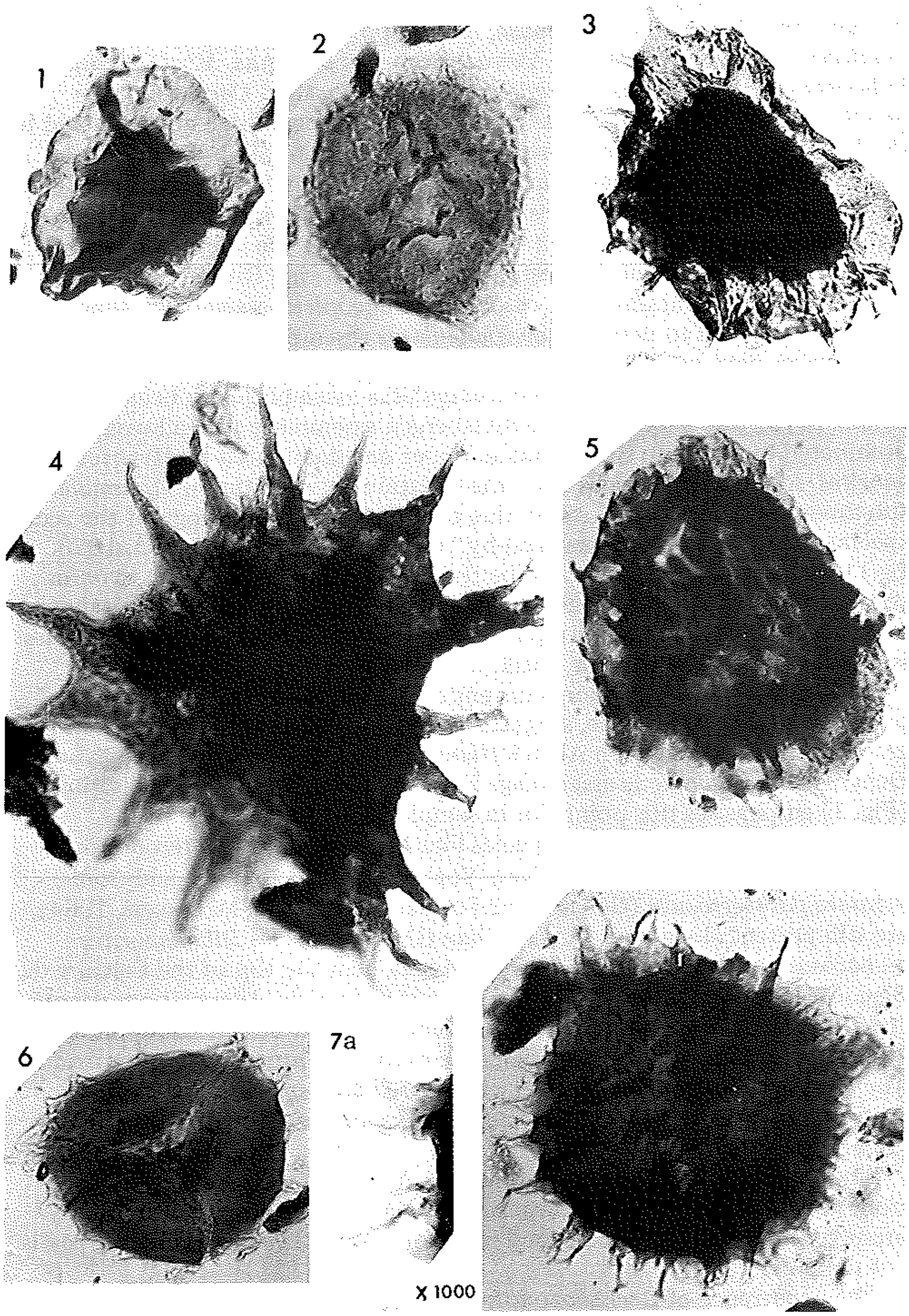
Eleven species are in common with the Spitsbergen assemblage (Vigran, 1964; Allen, 1965, 1967, 1973). They are *Archaeozonotriletes variabilis*, *Convolutispora disparalis*, *Rhabdosporites langii*, *Bullatisporites bullatus*, *Cirratriradites dissutus*, *Grandispora inculta*, *Ancyrospora langii*, *A. ancyrea*, *Perotrilites ergatus*, *Samarisporites triangulatus* and *Chelinospora concinna*. All but two (*B. bullatus* and *C. dissutus*) were only found in the *triangulatus* assemblage.

The Spitsbergen sediments are dated Early to Late Givetian by Tarlo (1964) comparing psammosteid faunas with equivalents in the Baltic area.

PLATE IV (All photographs × 500, except where otherwise stated)

1. *Auroraspora micromanifesta* (Hacquebard) Richardson. Slide 2F, 22/24, level A, Calcaire de Blacourt.
2. *Perotrilites ergatus* Allen. Slide 28A, 30/52, level H, Calcaire de Blacourt.
3. *Ancyrospora angulata* Tiwari et Schaarschmidt, Slide 26, 21/47, level H, Calcaire de Blacourt.
4. *Ancyrospora langii* Taugourdeau-Lantz. Slide 26, 24/81, level H, Calcaire de Blacourt.
5. *Ancyrospora loganii* McGregor. Slide 2H, 30/08, level A, Calcaire de Blacourt.
6. *Ancyrospora ancyrea* var. *brevispinosa* Richardson. Slide 2H, 20/77, level A, Calcaire de Blacourt.
7. *Ancyrospora ancyrea* var. *ancyrea* Richardson. Slide 25, 11/84, level H, Calcaire de Blacourt. 7a. Detail of 7, × 1000.

PLATE IV



Thirteen taxa are in common with the Orcadian basin of northeast Scotland (Richardson, 1965). They are *Dibolisporites* cf. *gibberosus, Rhabdosporites langii, Acanthotriletes* cf. *horridus, Ancyrospora ancyrea* var. *ancyrea, A. a.* var. *brevispinosa, Auroraspora macromanifesta, A. micromanifesta, Grandispora velata, Verrucosisporites premnus, V.* cf. *uncatus, Dibolisporites echinaceus, Rhabdosporites parvulus* and *Corystisporites multispinosus*. None of them belongs to those species which are restricted to the Eifelian—Givetian transitional layers (Richardson, 1965, fig.9). Most of the Orcadian species range up to the Givetian Eday Group, but four (*A.* cf. *horridus, R. parvulus, V. premnus, V.* cf. *uncatus*) are restricted to that level. The Eday Group is placed in the lower part of the *Microbranchius—Tristichopterus* fish zone of Westoll (1951). Following Richardson (1974), the Eday Group contains the *Densosporites devonicus* assemblage zone which is supposed to underly the *triangulatus* assemblage, although both assemblages have never been cited in a same section.

The question of the base of the *triangulatus* assemblage has been raised by Allen (1973) who subdivides the Spitsbergen assemblage into a lower one dominated by patinate spores and an upper one dominated by *Hystricosporites*. Allen (1973) argues that "the variation between the two *triangulatus* sub-assemblages is most probably due to differences in lithology of the rock specimens, rather than in stratigraphy" (see also Alpern and Streel, 1973, fig.11). This of course could also be true for the change from the *eximius* to the *triangulatus* assemblages in the Fiskekløfta or West-Lagercrantzberget sections although the abrupt replacement of about two thirds of the species is more suggestive of a major break.

An analysis of the miospore content of the Calcaire de Blacourt, part of our *triangulatus* assemblage, suggests that it occupies an intermediate stratigraphical position between Allen's *triangulatus* assemblage and the Orcadian *Densosporites devonicus* assemblage zone. A study of the species distribution (Fig. 1) emphasises this point, for in sample G—02, at the base of the Calcaire de Blacourt, Givetian species like *Aneurospora* cf. *heterodonta* (Panther Mountain Formation, New York State; Streel, 1972) and *Convolutispora paraverracuta* (Ghost River Formation, Alberta; McGregor, 1964), are still present along with the Orcadian Givetian species *Dibolisporites gibberosus* and *Rhabdosporites langii*. Again, near the top of the Calcaire de Blacourt two other Givetian species disappear, namely *Aneurospora goensis* and *Biornatispora reticulata* (Goé, Belgium; Lele and Streel, 1969) along with most of the Orcadian Givetian species like *Acanthotriletes* cf. *horridus, Ancyrospora ancyrea* var. *ancyrea, A. ancyrea brevispinosa, Auroraspora macromanifesta, A. micromanifesta, Grandispora velata, Verrucosisporites premnus* and *V.* cf. *uncatus*.

Since the limestone samples from units A to M in the Griset quarry and from units I and J in the Ferques trench (where spore sample 33 is poorly preserved) have not provided good miospore assemblages greater accuracy is not possible.

The occurrence of *Archaeozonotriletes variabilis* at the lowest level does not contradict the transitional character of the lower part of our assemblage as this species has also been recorded with many Orcadian Givetian spores (but without *S. triangulatus*) in the Escuminac Formation of Quebec (Brideaux and Radforth, 1970).

The miospore content of the Schistes de Beaulieu is impoverished in species. This seems related to more homogeneous miospore sizes, dominance of *Geminospora lemurata* or single laevigate species not recorded in Fig.1, and abundance of acritarchs. Disappearance of *Dibolisporites echinaceus* and *Retusotriletes rugulatus* as well as the first occurrence of *Convolutispora* cf. *subtilis* and *Verrucosisporites* cf. *grandis* should be ascertained by studying more samples.

More reliable are the following species occurring within unit H, particularly in sample 26, in the Ferques trench because their incoming is observed in a sequence of seven closely spaced samples of similar lithofacies: *Cirratriradites jekhowskyi*, a very distinctive species with a narrow zone; *Geminospora lemurata*, one of the most abundant spores of the so called Givetian—Frasnian assemblages published throughout the world; *Chelinospora concinna*, a typical species characteristic of the lower of the two *triangulatus* sub-assemblages described by Allen (1973). The appearance of these species in the stratigraphic sequence just above the succession of conodont faunas IV and V, a possible lateral equivalent of the *Pharciceras lunulicostata* (Iα) base, may well be useful for correlation. Other characteristics might of course correlate with the faunal evidence in the higher parts of the sequence, but they cannot be demonstrated in our sections due to unfavourable lithofacies.

Considering again the miospore distribution chart of Taugourdeau-Lantz (1971, table 1) and providing the synonymy listed below is accepted, we may note the following points:

(1) *Ancyrospora langii, Grandispora tomentosa* and *Samarisporites triangulatus* (syn. : *S. euglyphus*) are not restricted to the Frasnian but range at least from the Middle Givetian.

(2) The disappearance of *Samarisporites inaequus* and *Grandispora inculta* (syn. : *Endosporites globosus*) does not precede but follows the incoming of *Cirratriradites jekhowskyi* and *Geminospora lemurata* (syn. : *G. maculata*); they more or less serve to delineate the Givetian/Frasnian boundary within the lithological unit H of the Ferques trench, a lateral equivalent of the lower part of the Fromelennes Formation in the Ardennes type area.

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