Annales de la Société Géologique de Belgique, tome 120, fascicule 1, 1997, 1er semestre, pp. 23-72.

This paper is respectfully dedicated to the memory of Francine Martin (1937-1994)

AN ANNOTATED BIBLIOGRAPHICAL REVIEW OF ORDOVICIAN ACRITARCHS

Thomas SERVAIS[1]

(2 figures & 1 table)

1. Université des Sciences et Technologies de Lille, Paléontologie, URA 1365 du CNRS, F-59655 Villeneuve d'Ascq Cedex, France.

ABSTRACT. The present work is an attempt to compile all bibliographic references concerning acritarchs described in the Ordovician System. It contains nearly 700 references, including books, publications, unpublished Ph.D. theses, manuscripts, and abstracts from international conferences. The survey of the literature gives a synthesis on the stratigraphical and regional distribution of Ordovician acritarchs known to the present day. Most articles have been published regarding localities in Europe, followed by North America and North Africa. Data from other parts of the world remain patchy. Over 250 acritarch genera are used in the Ordovician, the number of species remains unknown, but probably exceeds 2000.

KEYWORDS: Ordovician, acritarchs.

RESUME. Index bibliographique annoté des acritarches de l'Ordovicien. Le présent travail est une tentative de compilation de toutes les références bibliographiques relatives aux acritarches décrits dans les séries de l'Ordovicien. Il contient presque 700 références de livres, d' articles scientifiques, de thèses de doctorat inédites, de manuscrits et de résumés de conférences internationales. Ce recensement de la littérature est accompagné d'une synthèse de la distribution stratigraphique et régionale des acritarches de l'Ordovicien connus à ce jour. Les publications les plus nombreuses concernent des localités d'Europe. Viennent ensuite l'Amérique du Nord et l'Afrique du Nord. Les données des autres parties du monde restent sporadiques. Plus de 250 genres d'acritarches ont été utilisés dans l'Ordovicien. Le nombre d'espèces reste inconnu. Il dépasse probablement 2000.

MOTS-CLES: Ordovicien, acritarches.

ZUSAMMENFASSUNG. Bibliographischer Index der ordovizischen Acritarchen. Die vorliegende Arbeit ist ein Versuch der Zusammenstellung aller bibliographischer Daten der ordovizischen Acritarchen. Sie enthält nahezu 700 Referenzen, darunter Bücher, wissenschaftliche Publikationen, unveröffentlichte Doktorarbeiten, Manuskripte und Abstrakte internationaler Tagungen. Der Literaturüberblick gibt eine Synthese der stratigraphischen und regionalen Verbreitung der ordovizischen Acritarchen bis zum heutigen Tag. Die meiste Literatur betrifft europäische Lokalitäten, gefolgt von Nordamerika und Nordafrika. Daten aus anderen Teilen der Welt bleiben sporadisch. Über 250 Acritarchengattungen werden im Ordovizium benutzt, die Zahl der Arten bleibt unbekannt. Sie übertrifft wahrscheinlich 2000.

SCHLÜSSELWÖRTER: Ordovizium, Acritarchen.

1. INTRODUCTION

Acritarchs are diverse and abundant in marine sediments of late Precambrian and Palaeozoic age. They appear in the upper Proterozoic and are the dominant group of palynomorphs in many Lower Palaeozoic rocks where they are widely used for biostratigraphical purposes.

Compared to other biostratigraphically important Ordovician fossil groups, such as trilobites, conodonts, and graptolites, the research on acritarchs is relatively young. The first papers were published in the early 1930's, but the number and importance of publications increased only with the development of the oil industry at the end of the 1950's. Nevertheless, the amount of published data is today so high that it is very difficult, if not impossible, to survey all acritarch literature. The continuous creation of 'new' species and genera, which are unequivocally a redescription of previously erected taxa, is without doubt one of the consequences of the insurmountable amount of published data.

1.1. PREVIOUS BIBLIOGRAPHICAL REVIEWS

To the present a complete acritarch bibliography has not been published. We do not know how many acritarch publications exist. The number of acritarch taxa and species can also be estimated only.
Thirty years ago, Downie & Sarjeant (1964) compiled an annotated bibliography of dinoflagellates and acritarchs, including an index to formations from which these microfossils have been described and an index to the names of taxa erected for both groups. Fifteen years later, Cramer & Diez (1979) summarized in their important survey paper "Lower Palaeozoic acritarchs" the taxonomy, stratigraphy and regional distribution of Early Cambrian to Devonian acritarchs in a review of literature available by mid-1979. They added some 280 acritarch references to Downie & Sarjeant's (1964) list.

The acritarch catalogues of Eisenack *et al.* (1973, 1976, 1979a, 1979b) contained the description of 1217 selected species of acritarchs, tasmanitids and leiospheres distributed in 201 genera. This catalogue series gave an idea of the number of forms described up to the end of the 1970's. Not complete, it was nevertheless very useful and presented a good overview on acritarch research.

More recently, Fensome *et al.* (1990, 1991) published their index to acritarch and prasinophyte taxa. This index is very helpful because it gives a clear view on (nearly all) acritarch taxa described by the end of the 1980's. It was compiled by using a data base which was initiated in the 1960's by a consortium of oil companies. At the time of publication of the index, this data base contained over 15,000 pre-Quaternary palynological publications. The reference list in Fensome *et al.* (1990) includes only the publications which contain the description of new taxa and/or taxonomical changes. However, for a comprehensive study of the palaeogeographical distribution and the stratigraphical range of each individual acritarch taxa, all references are needed. Therefore, the compilation of a complete bibliography appears necessary.

1.2. AN ORDOVICIAN ACRITARCH INDEX

Tappan & Loeblich (1973) reviewed several fossil groups of the oceanic plankton and figured the acritarch species diversity totalled by geological periods. According to their study, the Ordovician is the period providing the greatest number of acritarch species. In the Cambrian about 150 species were numbered, over 400 acritarch species were described in the Ordovician, over 200 in the Silurian, and over 300 in the Devonian (Tappan & Loeblich, 1973).

Today, twenty years later, the amount of publications, genera, and species is much higher. The present work is an attempt to compile all references concerning acritarchs described in the Ordovician System. It contains nearly 700 references. However, it is certainly not complete. Over 250 acritarch genera are used in the Ordovician (see 2.4.). The number of species remains unknown, but probably exceeds 2000.

The 700 references of the present bibliographical review include books, publications, unpublished Ph.D. theses, manuscripts, and abstracts from international conferences. Some general papers on acritarchs, which do not deal specifically with Ordovician taxa, are also included. Other papers which contain recycled Ordovician acritarchs in younger sediments are also cited.

A series of problems occurred during the compilation of the present review. Not all publications were available prior to publication of this review. Some citations have simply been copied from the reference lists in other publications. Therefore, the references in the present work are not always complete and/or correctly cited, and not always presented in the same style.

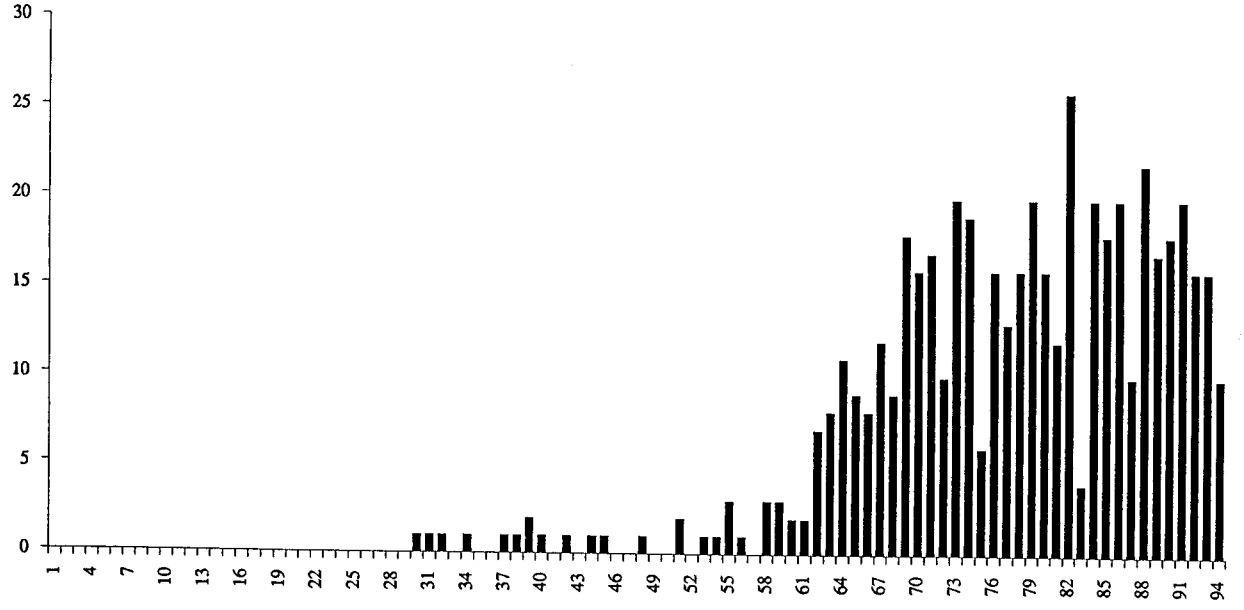

Figure 1. Diagram to show the rate of publication (between 1901 and 1994) of 511 articles concerning Ordovician acritarchs. The literature from the former Soviet Union (about 50 references) is not included.

The literature from the former Soviet Union presents considerable difficulties. As also mentioned in the index by Fensome *et al.* (1990), complete citations are not available for numerous Russian papers. Furthermore, only few papers are translated or contain English summaries. Therefore, the access to these data is difficult. In the present reference list probably only a minor part of Russian literature is cited.

2. SURVEY OF ORDOVICIAN ACRITARCH LITERATURE

2.1. INTRODUCTION - GENERAL PAPERS

Only few survey papers on acritarchs exist. They are cited here because they allow a good overview of the group and they may be of great help to become aquainted with these microfossils.

For the original definition of the "group Acritarcha", the reader is referred to Evitt (1963b). Other definitions are given in Downie *et al.* (1963) and more recently in Fensome *et al.* (1990).

The most recent, important review of the acritarch group is that of Martin (1993). This paper first explains what acritarchs are, and how to find and recognize them. It examines more closely their biological affinities, their life-style, their palaeoecology, and their evolution through geological time, from the Precambrian to the present.

Other important reviews, which give a good overview of the group, are those of Tappan (1980) and Mendelson (1993). A further review by Strother (1996) is published in the A.A.S.P. 25th anniversary publication "Palynology: principles and applications". The important indexes of Downie & Sarjeant (1964), Cramer & Diez (1979), and Fensome *et al.* (1990, 1991) and the catalogue series of Eisenack *et al.* (1973, 1976, 1979a, 1979b) have already been mentioned in the previous paragraph (see 1.1.). Another general paper is Downie's (1984) review of British acritarchs, which contains a good general introduction to acritarch research. Downie (1984) illustrated by line drawings and range charts some 400 of the most important and common species present in British Cambrian to Devonian sections. Short notes and a few line drawings are also given for Precambrian, Carboniferous, Permian, and Mesozoic acritarchs.

The range charts indicated in Downie (1984), as those published in Diez & Cramer (1974, 1977), should be regarded very critically, however. In fact, none of these ranges is precise, because the knowledge of the exact stratigraphical range and geographical distribution of most taxa remains poor. Only a systematic and rigorous revision of acritarch taxonomy, combined with the biostratigraphical control of all occurrences at a world-wide scale, would lead to a better knowledge of the stratigraphical range and geographical distribution of acritarch taxa.

Acritarchs have sometimes made the impossible possible by giving an age for sediments which were considered to be devoid of fossils. This is the reason why most of the articles on Ordovician acritarchs are rather small contributions, essentially focused on the biostratigraphical application of these microfossils. Monographs including a detailed contribution to acritarch systematics are rare. Few investigations have been coupled with research on other fossil groups, such as graptolites or trilobites, from the same samples or sections.

Studies on the palaeoenvironment of the acritarchs are also very rare in the Ordovician. Only two papers have been published: Jacobson (1979) and Wright & Meyers (1981).

Important parts of research on Ordovician acritarchs remain unpublished, such as the results of investigations which are the property of oil companies. The most important data are generally concentrated in Ph.D. and doctoral theses, but these works also remain partly unpublished. Therefore, the following paragraph surveys the Ph.D. and doctoral studies focused on the study of Ordovician acritarchs.

2.2. PH.D. AND DOCTORAL STUDIES

30 Ph.D. or doctoral theses, which are listed in the present index, were concentrated on the research on Ordovician acritarchs. They constitute the most important basis of the present knowledge on the systematics, the stratigraphical ranges, and regional distributions.

Unfortunately, not all results of these investigations are published. Of the 30 theses listed here, 26 were presented at European Universities, three at North American Universities and one in China.

2.2.1. England

The University of Sheffield, England, can be considered as the most prolific research institution of Lower Palaeozoic acritarchs. Under the supervision of Charles Downie, four Ph.D. studies were focused on the Ordovician.

Rasul (1971) investigated the Tremadocian of the Shineton Shales, Shropshire, Welsh Borderland. He published his results in a series of smaller papers reviewing the systematics of some taxa (Rasul, 1974, 1976, 1977) and presenting a zonation based on the most important species (Rasul & Downie, 1974; Rasul, 1979).

Booth (1979) investigated acritarch assemblages from Arenigian and Llanvirnian sections in north Wales, Shropshire, and the Lake District. His taxonomical (three new genera, seven new species) and biostratigraphical results (five microfloral zones in the British Arenigian-Llanvirnian) remain unpublished.

The results of Molyneux's (1981) micropalaeontological investigations in the Manx Group, Isle of Man, are summarized in a short paper (Molyneux, 1979).

The results of the Ph.D. study of Turner (1979), focused on the acritarchs of the type-Caradocian in the Welsh Borderland, are published in a monograph (Turner, 1984) and three smaller articles (Turner, 1980, 1982, 1985).

Another British Ph.D. study is that of Al-Ameri (1980) who investigated Late Ordovician and Silurian strata from Libya at Kings College, London.

2.2.2. France

The first French thesis ("thèse de troisième cycle") on Ordovician acritarchs was presented at the University of Rennes in June 1967 by Henry. The results of this work concerning Ordovician acritarchs and chitinozoans from the Crozon Peninsula, western Britanny, was published in a large paper (Henry, 1969). At the same institution, Paris (1971) presented a geological study of the area around Menez-Belair, Britanny, including the description of a few Ordovician acritarchs.

Rauscher (1974a) was the first to study the French Ordovician and Silurian sections in detail, investigating acritarchs and chitinozoans from the Ordovician of the Montagne Noire, Normandy, and of the Aquitaine. Cocchio (1981) investigated Ordovician acritarchs from Southern France (Montagne Noire and Pyrenees). These two theses have been published completely.

Elaouad-Debbaj (1981) presented two theses at Rennes University. The first ("thèse de troisième cycle") concerned Ordovician acritarchs from Portugal. In a second thesis ("thèse d'état"), she (1987) investigated Moroccan Ordovician acritarchs and chitinozoans. This work is published in a series of papers (Elaouad-Debbaj, 1984, 1988a, 1988b).

Le Herrise's (1988) research was concentrated on the Silurian of Gotland, Sweden. It also included investigations on acritarchs of the Late Ordovician which are not yet published.

Oulebsir (Rennes, 1992) presented his results of the Algerian Ordovician at Rennes University. Rahmani-Antari (1995) recently defended her investigations on Lower Palaeozoic palynomorphs from Morocco at the University Paris VI.

2.2.3. Belgium

Three theses on Lower Palaeozoic acritarchs have been presented in Belgium. Martin (1968) investigated Ordovician and Silurian sequences in the Brabant Massif and the Condroz Ridge. Vanguestaine (1973) studied the Cambrian and Lower Ordovician of the Ardennes, including the French part of the Rocroi and Givonne Massifs. Servais (1993b) reviewed the biostratigraphy and the systematics of some Ordovician formations of these areas and extended his research to the East into the Rhenish Massif (W-Germany) and the Island of Rügen (NE-Germany).

2.2.4. Germany

Wolf (1980c) investigated Early Ordovician acritarchs from Spain in his doctoral thesis. The results are summarized in two papers (Wolf, 1980a, 1980b). Welsch published the results of his investigations on the Middle Cambrian to Tremadocian acritarchs from North Norway in a monographical paper (Welsch, 1986). Mette (1987) investigated Late Cambrian and Early Ordovician acritarchs from the Sierra Morena, SW-Spain for his Diplom-thesis and published the results in a single paper (Mette, 1989). Eiserhardt (1991a) presented his doctoral thesis as a compilation of publications of numerous smaller papers (Eiserhardt, 1989a, 1989b, 1991b, 1991c) and a monograph (Eiserhardt, 1992) on the Late Ordovician acritarchs from the Öjlemyrflint erratics.

In Eastern Germany, Heuse (1990) investigated the Late Precambrian to Ordovician sequence of the Schwarzburg-Anticline, Thuringia, describing Early (Tremadocian and Arenigian) and Late Ordovician (Ashgillian) assemblages. Sehnert (1991a) reinvestigated the Wippra Unit of the Harz Mountains, where she studied Ordovician to Lower Devonian palynomorphs.

2.2.5. Italy and Spain

At Pisa University, Italy, Di Milia (1988) presented her results on the Cambro-Ordovician Solanas Sandstone, which are published in numerous smaller papers (Tongiorgi *et al.*, 1982a, 1982b, 1984; Albani *et al.*, 1985, 1992; Albani, 1989; Di Milia & Tongiorgi, 1991, 1992, 1993; Di Milia *et al.*, 1993). Ribecai (Pisa, 1988) presented a graduate thesis ("Tesi di Laurea") at the same institute on Late Cambrian and Tremadocian acritarchs from Öland, Sweden. The results of this thesis concerning the Ordovician assemblages are presented in a short paper (Tongiorgi & Ribecai, 1990).

In Spain, Fombella-Blanco (1979b) investigated the Cambro-Ordovician Oville Formation. The results of this thesis and further studies on the same assemblages are published in a series of smaller papers (Fombella, 1978, 1979a; Fombella-Blanco, 1982, 1984, 1986; Fombella-Blanco *et al.*, 1992; Fombella Santos & Cachan Santos, 1992).

2.2.6. United States and Canada

In the United States, Jacobson (1978b) investigated Middle and Upper Ordovician acritarch assemblages in New York State and the Cincinnati region in Ohio and Kentucky. He published his results in two abstracts (Jacobson, 1977a, 1977b) and one paper (Jacobson, 1978a). Colbath's Ph.D. study (1983) on the palaeoecology on palynomorphs from the Upper Ordovician-Lower Silurian of the southern Appalachians, U.S.A., are summarized in a short paper (Colbath, 1989).

In Canada, Duffield (1982) presented her research on Late Ordovician-Early Silurian acritarch biostratigraphy and taxonomy from Anticosti Island, Québec, of which the results are published in two papers (Duffield & Legault, 1981; Duffield & Legault, 1982).

2.2.7. China

The only Ph.D. thesis on Ordovician acritarchs from Asia known to the author of the present review is that of Li Jun (1991) on Early Ordovician acritarchs from SW-China. This research in collaboration with the University in Sheffield is published in four papers (Li Jun, 1987; Li Jun, 1989; Li Jun, 1990a; Li Jun, 1990b).

2.3. A REVIEW ON ORDOVICIAN ACRITARCH LITERATURE

Fig. 1 shows the rates of publication (between 1901 and 1994) of 511 articles concerning Ordovician acritarchs. The literature from the former Soviet Union (about 50 references), the Ph.D. or doctoral theses (30) and the abstracts (about 95) are not included. The first articles were published in the 1930's and 1940's. The publication rate increased in the 1950's and especially in the 1960's. Since the end of the 1960's, between 15 to 20 papers are published per year.

The first publications on Ordovician acritarchs are those from Eisenack in the 1930's. Eisenack's (1930 *et seq.*) research was focused on assemblages from Bohemia, the Baltic area and Germany. In the 1940's, Deflandre (1942 *et seq.*) began his investigations on material from France. Other pioneers in the study of Ordovician acritarchs started their research in the 1950's: Deunff (1951 *et seq.*) on material from Brittany, France; Downie (1958 *et seq.*) on British sections; and Timofeev (1958 *et seq.*) on assemblages from the Soviet Union.

Deunff, Downie and Eisenack are also the authors with the highest number of publications on Ordovician acritarchs. They are followed by Burmann (1965 *et seq.*), who investigated assemblages from the former G.D.R. (eastern Germany); Kalvacheva (1969 *et seq.*) who studied the Bulgarian Ordovician; Martin (1966 *et seq.*), who published detailed taxonomical studies on assemblages from Belgium, France, Canada, Australia, China, etc.; Molyneux (1979 *et seq.*), who published the most recent results from England and Wales; and Vavrdovà (1965 *et seq.*), who investigated some Bohemian assemblages during the last 30 years.

In this section, the Ordovician acritarch literature is overviewed on a world-wide scale. The present survey is based on the articles, books, and abstracts published by the end of 1994 which are available to the author. Papers which are in preparation or in press are not considered.

The survey is divided into geographical areas. It begins with the European countries, of which the literature is the most abundant. Then, it summarizes investigations in the former Soviet Union, North Africa, and North America, before listing the data of the other parts of the world.

2.3.1. Western European acritarch literature

a) United Kingdom

About 50 papers and 15 abstracts deal with Ordovician acritarchs from the British Isles. They cover the whole Ordovician, from the Tremadocian to the Ashgillian. Numerous outcrops and boreholes from England, Wales, and Scotland have been investigated. The reader is referred to Downie (1984) and Molyneux (1990) for an overview of the British data. Preservation of Ordovician palynomorphs is generally poor. Only the sequences of Shropshire, in the Welsh Borderland, show a good preservation.

The Tremadoc and Arenig Series are the most extensively studied in Britain. Rasul (1979) established eight informal biozones in the Tremadocian of the Shineton Shales, Shropshire. The Tremadocian/Arenigian boundary beds bear a distinctive acritarch assemblage, named the *trifidum*-flora (Fortey *et al.*, 1991). A succession of eight acritarch assemblages has been described by Molyneux (1987) in the Arenigian of South Wales. The Arenigian of the Skiddaw Group may also yield an acritarch biostratigraphy so that a formal definition of acritarch biozones may soon be possible in the British Tremadocian-Arenigian (Molyneux, 1990).

Data from the Llanvirnian and Llandeilian are poor. While investigations on the Llanvirnian are inadequately documented and partly unpublished (e.g. Booth, 1979), the only good results from the Llandeilian are those from the type area investigated by Turner (1984).

The type-Caradocian was described in detail by Turner (1985). Acritarch biozones have not yet been defined, however. Data on the Ashgillian are very rare. However, preliminary results indicate a biostratigraphical potential that is worth developing (Molyneux, 1990; Barron & Molyneux, 1992).

A few papers concern Ordovician acritarchs which are reworked in younger sediments (e.g. Richardson & Rasul, 1978a; Richardson & Rasul, 1978b; Richardson & Rasul, 1978c; Edwards *et al.*, 1978; Thomas, 1978; McLean, 1990; McLean, 1991). Recycled Ordovician acritarchs have even been used as provenance indicators (e.g. McCaffrey *et al.*, 1992).

b) Ireland

About 10 papers concern the research on Ordovician acritarchs from Ireland. A first short report of few specimens was published by Downie & Tremlett (1968). The following publications were also rather small. For a summary of investigations in the Irish Ordovician, the reader is referred to the survey paper of Smith (1981). Recycled Ordovician acritarchs have been recorded in Carboniferous sediments of subsurface material in County Clare (Clayton *et al.*, 1980).

c) France

After the United Kingdom, France is the country with the most abundant literature on Ordovician acritarchs. About 40 papers are published. The most important part, nearly 20 publications, concerns the Ordovician sequences from Brittany, which were extensively studied by workers from the Universities of Rennes and Brest. The reader is referred to Paris & Le Hérissé (1992) for a good overview on the Paleozoic of Western Britanny including a complete compilation of references on organic-walled microfossils of the Armorican Palaeozoic.

Another series of publications concerns the Ordovician of the Montagne Noire, S-France. Deflandre (1942, 1945) started investigations in this area. In the 1970's, Rauscher (1971, 1974a), Martin (1973), Fournier-Vinas & Donnot (1977), and Fournier-Vinas (1978) investigated in more detail assemblages of the Ordovician of the Montagne Noire sections.

The Massif de Mouthoumet, in the Pyrenees, was the subject of the research of Baudelot & Bessière (1975, 1977) and Cocchio (1981, 1982). Baudelot *et al.* (1976) recorded Ordovician acritarchs from Corsica. Further smaller publications include that from Baudelot & Fournier-Vinas (1984) on the Palaeozoic boreholes of the Aquitaine, SW-France, those from Deflandre & Ters (1966) and Ters & Deflandre (1966) on the Cambro-Ordovician of the Vendée department (W-France), and the paper of Reitz & Wickert (1990) on the Cambro-Ordovician from the Northern Vosges Mountains (E-France).

None of the papers on French Ordovician acritarchs includes biozonations, even at a local scale. Most publications are very small and announce the discovery of acritarchs providing Ordovician age evidence. Preservation is generally moderate to poor. The most detailed study to which the reader may be referred is still the thesis of Rauscher (1974a).

d) Belgium

Ordovician sediments in Belgium are present in the Brabant Massif, the Condroz Ridge (Bande de Sambre-et-Meuse), and the Ardennes. Preservation of palynomorphs is moderate to very poor. Some of the assemblages are very diverse, however.

Martin (1966, 1967, 1969a, 1969b, 1969c, 1969d, 1974, 1977a; Martin *et al.*, 1970; Martin & Rickards, 1979) first investigated the acritarchs from the Ordovician and Silurian from the Brabant Massif and the Condroz Ridge. Vanguestaine started investigations in the Cambro-Ordovician of the Ardennes, including the southernmost part of the Rocroi Massif in northern France (Vanguestaine, 1974). He also described recycled Ordovician acritarchs in Early Devonian sediments of Belgium (Vanguestaine, 1979; Roche *et al.*, 1986; Steemans, 1989).

Numerous publications have been published since that time, describing Tremadocian, late Arenigian to Llandeilian and Late Ordovician assemblages, of which the exact age is generally not documented by other fossils. For a review of the Belgian Ordovician, including acritarch occurrences, the reader is referred to Servais *et al.* (1993).

e) Germany

The first paper on Ordovician acritarchs from Germany is that of Eisenack (1939) on a poorly preserved assemblage from the Rhenish Massif (Rheinisches Schiefergebirge). 50 years later, this area was reinvestigated by Maletz & Servais (1993), who described assemblages of early Llanvirnian age from the two lowermost formations of the Herscheider Schichten of the Ebbe Anticline.

The most important contribution on German acritarchs is the research in the 1960's and 1970's of Burmann. She investigated Ordovician sediments of the former G.D.R. from the Harz Mountains (e.g. Burmann, 1973d, 1973e, 1973f), the Vogtland area, SE-Germany, and from the Island of Rügen, NE-Germany (e.g. Burmann, 1968, 1970, 1976). Except for the Rügen material, all palynomorphs in Burmann's assemblages are completely fragmented ("mosaikzerlegt") and, therefore, can only be observed in thin sections (e.g. Burmann, 1965, 1969). The

exact localisations and the precise ages of Burmann's samples, which provided the types of some very important Ordovician acritarch taxa, remain unknown to the present day, unfortunately. The type-materials have not been accessible to subsequent workers.

Today, numerous Ordovician sediments of Germany have been investigated. The material is generally poorly preserved. Some of the areas which were studied by Burmann in the 1960's and early 1970's have been reinvestigated. Sehnert (1991a, 1991b) reexamined sections of the Wippra Unit in the Harz Mountains. The Ordovician of Rügen was reinvestigated by Servais and Eiserhardt (Servais & Katzung, 1993; Servais, 1994; Eiserhardt & Servais, 1993, 1994). Heuse's investigations are focused on the Schwartzburg Anticline, Thuringia, E-Germany (Heuse, 1989; Estrada *et al.*, 1994; Heuse *et al.*, 1994a, 1994b; Reitz & Heuse, 1994) and Saxony, E-Germany (Heuse, 1994; Linnemann *et al.*, 1988). Reitz (1991) published a lower Tremadocian assemblage from Bavaria. Paalits & Erdtmann (1993a) reported Ordovician acritarchs of the Görlitz Synclinorium, Saxony. Hammann *et al.* (1989) indicated reworked Ordovician acritarchs in the Lower Devonian of Bavaria.

The study of erratic boulders has a long tradition in Germany. Most of the erratics found in northern Germany come from Scandinavia, for example those found in Lower Saxony and Schleswig-Holstein which come from Öjle Myr (Gotland, Sweden). Such erratics have been the subject of extensive palaeontological research. They have also been treated by acritarch workers, such as Eisenack (e.g. 1944, 1965, 1968a) and Eiserhardt (e.g. 1992).

2.3.2. Central and Eastern European acritarch literature

a) Austria

Four small papers have been published to announce the discovery of Lower Ordovician acritarchs in the Eastern Alps in Austria (Reitz & Höll, 1989, 1990, 1991, 1992). All these assemblages are poorly preserved and only briefly described. Reitz & Höll (1989) first published a Tremadocian assemblage from the Untere Wildschönauer Schiefer, which constituted the first evidence for sediments of this age in the Northern Greywacke Zone. Reitz & Höll (1990) attributed another assemblage from the Innsbruck Quartzphyllite Group to the Tremadocian. The acritarchs in Reitz & Höll (1991) from the Untere Wildschönauer Schiefer were assigned to the Arenigian. Finally, Reitz & Höll (1992) republished and reillustrated some of the acritarchs which were figured in previous papers (Reitz & Höll, 1989, 1991).

b) Bohemia, Czech Republic

For a general understanding of the Czech Ordovician, the reader is referred to Havlicek & Fatka (1992) and Storch *et al.* (1993).

First descriptions of Bohemian Lower Palaeozoic acritarchs are included in some papers of Eisenack (e.g. 1934, 1948). The most extensive research in the Prague Basin in Bohemia, however, was by Vavrdovà (1965 *et seq.*). The results of this study are published in over 20 small papers. Vavrdovà's studies were focused on the Klabava and the Sarka formations, which were attributed to the Arenigian and the Llanvirnian, respectively. Other levels of the Ordovician sequence of the Prague Basin were also investigated. Some of the acritarch assemblages are well preserved and show a very high diversity. Vavrdova erected numerous new species and genera, which later were recorded from localities all around the world and became of great importance. Most of these taxa have been described from selected levels from few localities, such as "U Starého hradu" close to the hamlet of Klabava near Rokycany and the "Gabriela" mine at Krusna Hora near Beroun. Unfortunately, precise biostratigraphical information on the investigated samples from the Arenigian-Llanvirnian interval in the Prague Basin is not given in Vavrdovà's (1965-1993) papers. Therefore, the succession of the described acritarch assemblages published in Vavrdovà (1977, 1978, 1986, 1993) remains unclear, making international correlations difficult. Vavrdovà (1982a, 1988, 1989) also described assemblages from the Late Ordovician which contain acritarchs which she considered as recycled from the Cambrian and lower parts of the Ordovician.

Other publications on Czech acritarchs are those from Corna (1969, 1970) and Konzalova-Mazancova (1969). More recent studies are those from Fatka and Dufka, who combine acritarch and chitinozoan data with new results on macrofossils, especially graptolites. Fatka (1993) described acritarchs and chitinozoans from the Tremadocian/Arenigian boundary in the Prague Basin. In Fatka *et al.* (1994), new investigations and recent international correlations of the Bohemian graptolite horizons place

the Arenigian/Llanvirnian boundary, i.e. the succession of the Klabava and Sarka formations, in a new light. Dufka & Fatka (1993) described chitinozoans and acritarchs from the Ordovician-Silurian boundary in Bohemia.

c) Poland

The first report on acritarchs from Poland was the paper of Michniak (1959) on palynological investigations in sediments of the Holy Cross Mountains. Further publications on Ordovician acritarchs of this area are those of Jagielska (1962a, 1962b) and Gorka (1967). The latter author also published the most important paper on Polish Ordovician acritarchs (Gorka, 1969). It included a detailed description of assemblages from different parts of Poland from levels of late Tremadocian to late Ashgillian age. Gorka (1969) investigated samples from outcrops of the Kielce area, Holy Cross Mountains, from several boreholes in NE-Poland (East European Platform), and from erratics collected from different localities. The acritarchs from the Middle Ordovician of the boreholes Olsztyn and Strabla (NE-Poland) are described in Gorka (1979) and Gorka (1980), respectively.

The most recent study is that of Stempien (1990). She reinvestigated Ordovician and Silurian sections from the Holy Cross Mountains. While the preservation of the acritarchs of this latter area is generally moderate, those from the western rim of the East European Platform, investigated by Gorka (1969, 1979, 1980) are very well preserved.

d) Hungary

A single paper is published on Hungarian acritarchs of Ordovician age. Albani *et al.* (1985b), following the unpublished report of Bona (1972), recorded poorly preserved acritarchs from the Szabadbattyan borehole in the Bakony Mountains. The assemblage was interpretated as demonstrating a late Arenigian age.

e) Rumania

Very few data are published on Ordovician acritarchs from Rumania. The only papers are those of Beju (1964, 1971, 1972, 1973), who published lists of Ordovician acritarchs of the Moesic Platform.

f) Bulgaria

Kalvacheva (1969-1990) published over 20 papers on a few, very poorly preserved Ordovician acritarch assemblages from Bulgaria. For a summary of her research, the reader is referred to Kalvacheva (1986a). According to this latter study, the Diabase-Phyllitoid Complex and the lowermost part of the Rebrovo Complex (W-Bulgaria) can be attributed to the Arenigian on grounds of acritarch findings, the upper part of the Rebrovo complex bears late Llanvirnian macrofossils and Middle Ordovician acritarchs, while the Cerecel Formation provided Caradocian acritarchs.

More recent investigations on Late Ordovician to Llandoverian acritarchs from SE-Bulgaria are published in Lakova (1992) and Lakova *et al.* (1992).

2.3.3. Southern European acritarch literature

a) Italy

Numerous small papers have been published to describe Ordovician acritarchs from Italy. The constituents of these assemblages are generally poorly preserved. They were partly described from thin sections only.

The most important part of the publications concerns the Cambro-Ordovician of Sardinia. The Solanas Sandstone of Upper Cambrian to Arenigian age (SW-Sardinia) was extensively studied by workers of Pisa University (Albani, 1989; Albani *et al.*, 1985b, 1992; Di Milia, 1988; Di Milia & Tongiorgi, 1991, 1992, 1993; Di Milia *et al.*, 1993; Tongiorgi *et al.*, 1982a, 1982b, 1984).

A group of workers from Cagliari University focused their acritarch studies on other Sardinian sequences. Their results are published in numerous papers. First, Barca *et al.* (1981) reported upper Tremadocian-basal Arenigian acritarchs from the "Postgotlandiano" sequence of SW-Sardinia. In a subsequent paper, Barca *et al.* (1984) examined Tremadocian acritarchs from the upper part of the Bruncu Maresusus Unit of central Sardinia. Pittau (1985) published a detailed study on the Tremadocian acritarchs of the Arburese Unit (SW-Sardinia). Barca *et al.* (1987) indicated that the uppermost levels of the Cabitza Formation (SW-Sardinia) contains also Tremadocian acritarchs. Finally, new findings of acritarchs in the San Vito Sandstone provided a more precise dating of this unit, which yielded amongst

Middle and Upper Cambrian acritarchs also a Tremadocian assemblage (Barca *et al.*, 1989). Other publications in this area are those of Pittau Demelia & Del Rio (1982), Pittau & Del Rio (1983), and Naud & Pittau Demelia (1985).

A French group of workers from Toulouse University published their acritarch studies in Italy in three short papers. Majesté-Menjoulas *et al.* (1986) dated Cambro-Ordovician sediments of the Peloritan Mountains in Sicily. Boullin *et al.* (1984, 1987) investigated sediments in Calabria (S-Italy), which were attributed to the Cambro-Ordovician. These sediments were placed in relationship with some coeval formations of SW-Sardinia.

Another study in NE-Italy concerned Early Palaeozoic acritarch datings in the basement of the eastern part of the Alpine Belt (Sassi *et al.*, 1984a; Sassi *et al.*, 1984b; Sassi *et al.*, 1984c; Kalvacheva *et al.* 1986; Kalvacheva, 1988). The palynological data are extensively presented in Kalvacheva *et al.* 1986, pointing to a late Early Cambrian to Early Ordovician (Tremadocian) age of the investigated assemblages.

b) Spain

Diez & Gutierrez (1979) compiled all references on Spanish palynological studies published up to 1979. Their list included a single reference on Cambro-Ordovician acritarchs, that of Fombella (1978). Subsequently, a series of further papers have been published.

Fombella published further results on her investigations on the Cambro-Tremadocian Oville Formation (Fombella, 1979a; Fombella-Blanco, 1982, 1984, 1986; Fombella-Blanco *et al.*, 1992; Fombella-Santos & Cachan Santos, 1992).

Diez-Balda & Fournier-Vinas (1981) published a short note on acritarchs from the South of Salamanca. The investigations in the Early and Late Ordovician of Celtiberia (Sierra Morena) of Wolf are published in Wolf (1980a, 1980b) and mentioned in Hafenrichter (1980). The study of the Cambrian and Ordovician acritarchs presented in an abstract by Vanguestaine & Aramburu (1988) remains unpublished. Mette (1989) summarized his investigations on the Lower Palaeozoic rocks of the western Sierra Morena, describing the acritarch microflora of the Tremadoc/Arenig Barriga Shale in detail.

c) Portugal

Three papers have been published on Ordovician acritarchs of Portugal. Henry & Thadey (1971) presented a first short note on Late Ordovician acritarchs from the Serra de Buçaco (central Portugal). This area was investigated in detail by Elaouad-Debbaj (1981) for a doctoral thesis at Rennes University, France. A further publication is the short note on the biostratigraphical application of an acritarch association in the "Xistos com Phyllodocites" in the Barrancos Region, SE-Portugal, by Arriagha e Cunha & Vanguestaine (1988). The assemblage was interpretated as typical of the interval Arenigian-Llanvirnian.

2.3.4. Northern European acritarch literature

a) Sweden

The research on Swedish Ordovician acritarchs was concentrated on sediments from the islands of Öland and Gotland. Most of the Swedish sections yield very well preserved and diversified assemblages.

Eisenack (1930 et seq.) started the research in Sweden. He investigated the Ordovician of several countries around the Baltic Sea and published his results in numerous papers. He started his research on erratics collected from the coast of East-Prussia around Königsberg (the present Kaliningrad, western Russia). In subsequent papers, he described erratics and outcrop material from numerous other localities. Some of his publications concern Swedish Ordovician acritarchs from erratics (e.g. Eisenack, 1958) and outcrop material (e.g. Eisenack, 1959, 1968b, 1976).

Another early contribution is the description of spherical bodies from Scânia, South Sweden, described as leiospheres by Regnéll (1955).

Detailed taxonomical investigations from complete sections started with the investigations of Kjellström who investigated first the Grötlingbo borehole in SE-Gotland (Kjellström, 1971a, 1971b). He also investigated localities in Öland (Kjellström, 1972b) and Östergötland, S-Sweden (Johansson *et al.*, 1972; Kjellström, 1976).

Another detailed study on a borehole section from Gotland is that of Gorka (1987) of the Middle Ordovician of the Smedsby Gard drill core.

The recent investigations of workers from Pisa University on the Lower Palaeozoic sequences in Öland include investigations on the Furuhäll and Degerhamn sections, which provided Cambrian and Tremadocian assemblages (Bagnoli *et al.*, 1988; Ribecai, 1988; Tongiorgi *et al.*, 1988; Tongiorgi & Ribecai, 1990), and the Horns Udde, Hälludden, and Hagudden sections, which yield assemblages of Arenigian-Llanvirnian age (Righi, 1991; Ribecai & Tongiorgi, 1992, 1994).

Eiserhardt's (1984, 1985, 1986, 1987, 1989a, 1989b, 1991a, 1991b, 1992) investigations are focused on the acritarchs of the Late Ordovician Öjlemyrflint, Gotland. Another study in the Upper Ordovician from Gotland is that of Le Hérissé (1988).

Other, smaller contributions on Swedish Ordovician acritarchs are those of Gorbatschev *et al.* (1976), Guy-Ohlson & Lindqvist (1990), and Martin & Kjellström (1973).

b) Norway

The only published data of Norwegian acritarchs of Ordovician age are those of Welsch (1983, 1984a, 1984b, 1986). This author investigated the Middle Cambrian to Tremadocian sequence from the Digermul Peninsula, Finnmark, N-Norway. The Berlogaissa Formation yielded acritarch assemblages of early Tremadocian age.

c) Finland

Eisenack's studies on the Baltic area included also the description of Ordovician acritarchs from erratics collected in S-Finland (e.g. Eisenack, 1962b, 1965).

More recent research is published by Tynni and Uutela. Tynni (1975) first investigated acritarchs in the Ordovician from the Bothnian Sea. The material included Middle Ordovician samples from the Sylen Shoal and Palaeozoic erratics found in Quaternary deposits. In a subsequent paper, Tynni (1982) described Middle Ordovician and to a lesser extent Lower Ordocician assemblages from samples which were collected in Lower Ordovician sandstones from the Åland Islands, Bothnian Sea, and in Lower and Middle Ordovician limestones of borehole material from the Lumparn Bay (SW-Finland). Uutela (1989) reinvestigated erratics of Palaeozoic sediments collected from the coast of southwestern Finland. Her study was based on a total number of 2244 erratics, most of them of Ordovician age.

d) Denmark - Greenland

Investigations on acritarchs from the Danish Ordovician remain unpublished. The single record of Ordovician acritarchs from Greenland is that of Nøhr-Hansen & Koppelhus (1988), who described a few spores with trilete rays from Washington Land, North Greenland. The acritarch assemblage was attributed to the Late Ordovician.

2.3.5. Acritarch literature from the former Soviet Union

Numerous papers have been described from the Ordovician of the former Soviet Union. The present paper includes the references of about 50 publications. These data probably represent only a minor part of the acritarch literature which has been published. Only few papers are available, a minor part of them include an English summary. For most of the references, complete citations were not available.

The references included in this paper indicate that data exist from numerous regions of the former Soviet Union. The most important pioneer studies are those of Timofeev (1958 et seq.) who investigated Cambrian and Ordovician sequences from the Baltic region, Siberia, the Ural, Podolia (Ukraine), and the Russian Platform. This latter area was also studied by several other workers, as for example: Umnova (1971, 1974), Chibrikova (1972), Volkova (1984), and Vanderflit & Mikhailova (1992).

A further study on Siberian sections is that of Drobkova & Orlova (1966). Other papers concern material from Bielorussia (e.g. Piskun, 1974; Piskun, 1976), the Moscow Syncline (e.g. Umnova, 1975; Aristova, 1980); the Ural (Vladimirskaya *et al.*, 1956), and Kirghizia (Lopuknin, 1971). The most important data, however, concerns the Baltic States and especially Estonia.

The Baltic States

Eisenack studied not only numerous erratics deposited around the Baltic Sea, but also outcrop material from Scandinavia and the Baltic States. Numerous papers on Ordovician acritarchs from the Baltic area concerned Estonian outcrops (Eisenack, 1951, 1958a, 1959, 1962b, 1962c, 1965, 1967, 1968b, 1970).

Other publications are those from Wetzel (1967), Aristova (1976), and Bockelie & Kjellström (1979).

Timofeev (e.g. 1959) also described Lower Palaeozoic acritarchs from Estonia.

More recently, a series of new investigations has been published. The research of Paalits (Mens *et al.*, 1989; Heinsula *et al.*, 1991; Paalits & Erdtmann, 1993b) and Volkova (1988, 1989, 1993a, 1993b, 1993c, 1993d; Volkova & Mens, 1988; Volkova & Siverzeva, 1991) is focused on the Cambro-Ordovician boundary and the Tremadocian of several Estonian sections. A further important contribution to the knowledge of Ordovician acritarchs from Estonia is the recent investigation of the Rapla borehole by Uutela & Tynni (1991). The authors of this work investigated 99 samples of Arenigian to Llandoverian age and described numerous (more than 300) species, of which over 130 were considered as new.

Further research from the Baltic States includes the studies of Paskeviciene (1993a, 1993b), who investigated Middle and Upper Ordovician acritarchs of Lithuania and the Kaliningrad region (Russia), and of Jankauskas (1976) who published a short review of the research in the Cambro-Ordovician of the Baltic States.

2.3.6. Acritarch literature from North Africa

a) Morocco

The most important research on North African acritarchs of Ordovician age comes from Morocco. The preservation of the Moroccan material is poor to excellent, depending on the area which is investigated. Some of the Moroccan sequences probably contain some of the best successions for acritarch investigations of the peri-Gondwanan and Gondwanan areas.

The first papers on Moroccan acritarchs of the Ordovician are those of Combaz (1967b, 1968) and Deunff (1968a, 1968b). These authors described briefly some acritarchs from the Tremadocian.

Cramer and coworkers described many Ordovician acritarchs from Morocco, of which most were new taxa. Most of the material came from a few samples from subsurface material of the "upper Arenigian to Llanvirnian" from the Kasba Tadla Basin (Cramer, 1974; Cramer *et al.*, 1974a, 1974b; Cramer & Diez, 1975, 1976a, 1976b, 1977a, 1977b). Some of the sequences of the boreholes which were investigated by Cramer in the 1970's were recently redated by means of chitinozoans by Achab & Soufiane (1993). Their study indicated a late Arenigian age for the samples investigated by Cramer.

A series of smaller papers describing some other Moroccan assemblages are those of Deunff (1977), Marhoumi *et al.* (1982), Rauscher *et al.* (1982), Desteucq & Fournier-Vinas (1982), and Fournier-Vinas (1985).

More extensive research is that of Elaouad-Debbaj and Rahmani-Antari, who both worked in collaboration with French institutes. Elaouad-Debbaj (1981, 1987) presented her invesigations on Moroccan and Portuguese acritarchs and chitinozoans in two theses at Rennes University. Several papers concerning the Moroccan microfossils have been published: Elaouad-Debbaj (1984, 1988a, 1988b), Elaouad-Debbaj & Henry (1980). Rahmani-Antari (Rahmani, 1978, 1979, 1983; Rahmani-Antari, 1990) started her investigations on the Lower Palaeozoic palynomorphs (acritarchs, chitinozoans, spores, ...) in the 1970's and recently presented her Ph.D. at Paris VI University (Rahmani-Antari, 1995).

b) Algeria

Some Algerian sequences also yield very well preserved acritarchs in complete sections. Unfortunately, only minor parts of the results of the investigations by oil companies have been published. An important paper illustrates this situation: Jardiné *et al.* (1974) published in a summarized form the investigations of a French oil company. In the Ordovician, they recognized 8 biozones which were based on the ranges of selected acritarchs and chitinozoans. 160 acritarch species were listed but the paper included only the description of the new taxa and a short description of the biozones.

Other smaller contributions on Algerian material are those of Deunff (1961, 1964), Baudelot & Géry (1979) and Baudelot *et al.* (1981). More recently, Oulebsir (1992) presented his research on Ordovician chitinozoa (and acritarchs) at Rennes University.

c) Lybia

The situation in Lybia is similar. Only a few papers are available. Deunff & Massa (1975) published a first short note on three Ordovician formations attributed respectively to the Tremadocian, the Arenigian, and the Llanvirnian-Llandeilian. More recent investigations are those of Molyneux & Paris (1985), Molyneux (1988), and Hill & Molyneux

(1988). In these articles, Late Ordovician acritarchs from NE-Lybia are described and several assemblage biozones are established.

Al-Ameri (1980) presented his investigations focused on the Lybian Silurian at Kings College, London. This study included also the description of acritarchs of the Late Ordovician.

d) other African literature

Information from other African countries is nearly non-existant. Bär (1977) and Bär & Riegel (1980) described acritarchs of latest Ordovician to earliest Silurian age from Ghana, western Africa. Fielding (1992) announced first results of her investigations at the Ordovician-Silurian boundary from the Cedarberg Mountains in South-African at the 8th International Palynological Congress.

2.3.7. North American acritarch literature

a) United States of America

Over 30 papers and abstracts on Ordovician acritarchs from the United States of America are published. The earliest contribution is that of Hedlund (1960) and Wilson (e.g. Wilson & Hedlund, 1962).

However, the first important and detailed research was that of Alfred Loeblich Jr. and his wife Helen Tappan in the late 1960's and 1970's. Their studies were focused on the Middle Ordovician Bromide Formation of Oklahoma and the Upper Ordovician Dillsboro and Eden formations of Indiana. The results are published in numerous papers (Loeblich & Tappan, 1969; Loeblich, 1970a, 1970b; Loeblich & Tappan, 1971a, 1971b; Tappan & Loeblich, 1971; Loeblich & Tappan, 1976, 1978).

Other investigations of the early 1970's are those of Nygreen (1970) on material from Oklahoma and of McGregor & Cramer (1971) from samples of Manitoba.

Jacobson (1978b) and Colbath (1983) presented their Ph.D. theses in the late 1970's and early 1980's . Jacobson's investigations concerned mainly Middle and Upper Ordovician rocks from New York State, Ohio, and Kentucky (Jacobson, 1977a, 1977b, 1978a, 1979). The acritarch research of Colbath was concentrated on the Upper Ordovician of Indiana and on Upper Ordovician and Lower Silurian sections in the southern Appalachians (Colbath, 1979, 1980, 1981, 1986b, 1989).

Two papers focuse on the study of the palaeoenvironment of Ordovician acritarchs. Both works concern material from the United States: Jacobson's (1979) study from rocks from New York State, Ohio, and Kentucky and the paper of Wright & Meyers (1981) on subsurface material from Kansas.

Miller published a series of small papers on Ordovician acritarchs from several states, including material from Indiana, Missouri, Oklahoma and Texas (Miller, 1982; Miller & Wicander, 1982; Miller, 1988; Barker & Miller, 1990; Derby *et al.*, 1991; Miller, 1991).

Other investigations were presented at the 6th and 8th IPC, respectively, and concern material from Florida (Dorning & Hutter, 1984) and Michigan (Wicander, 1992).

b) Canada

A very important early paper is that of Staplin *et al.* (1966). The specimens described in this article which come from the "Middle Ordovician" Trenton Formation are actually of Late Ordovician age (Jacobson, 1987). Except for the publication of Nautiyal (1966), most of the other papers are much younger.

Martin investigated some Canadian Ordovician sequences in detail. Her investigations concern sections from Newfoundland (Dean & Martin, 1978; Martin, 1978, 1980b; Martin & Dean, 1981; Martin, 1982), Québec and Ontario (Martin, 1977b, 1980a, 1983), and Alberta (Dean & Martin, 1982; Martin, 1984, 1992). Parsons & Anderson (1991) announced some modifications of the existing zonal schemes based on further material from Newfoundland.

Legault was involved in another series of publications. She first investigated acritarchs and chitinozoans of Late Ordovician age from Orphan Knoll, Labrador Sea (Legault, 1982). Duffield & Legault (1981, 1982) investigated Upper Ordovician and Lower Silurian rocks from Anticosti Island, Québec, where Fielding (1992) investigated the Ordovician-Silurian boundary as well. Bunner & Legault (1988, 1989) and Gamarra & Legault (1991) published results of the Middle Ordovician Gull River and Bobcaygeon formations and of the Simcoe group of southern Ontario.

Jacobson & Achab (1984, 1985) also investigated the Late Ordovician of Anticosti Island. Mac Lean *et al.* (1986) and Miller & Williams (1988a, 1988b) analysed the bedrock of Hudson Strait in the North West Territories.

2.3.8. South American acritarch literature

Only few data on South American acritarchs have been published. They concern material from Argentina, Brazil, and Colombia.

Bultynck & Martin (1982) described some Early Ordovician acritarchs from the Argentinian Cordillera. Ottone *et al.* (1992) described in some detail the Lower Ordovician palynomorphs from the Acoite Formation from NE-Argentina. Three further, smaller papers are those of Volkheimer *et al.* (1980) and Melendi & Volkheimer (1982a, 1982b).

Padilha de Quadros (1986a, 1986b, 1988) described in three papers a poorly diversified assemblage attributed to the Arenigian-Llanvirnian. According to the author, this assemblage is the first record of Ordovician microfossils from Brazil.

Théry (1985) and Théry *et al.* (1986) published the single record of Ordovician acritarchs from Colombia. This assemblage is also mentioned in Pimentel *et al.* (1992).

2.3.9. Acritarch literature from Asia

a) China

Most of the data on Ordovician acritarchs from Asia come from China. Over 20 papers have been published, most of them in Chinese journals. The publication of the results started only in the 1980's.

The Cambrian-Ordovician boundary section in Dayangcha, Jilin Province (NE-China), proposed to serve as an international stratotype, provides also acritarchs which were described or mentioned in three papers (Yin Leiming, 1985, 1986; Chen *et al.*, 1988).

Several papers from different authors concern the well preserved and highly diversified assemblages of the Arenigian of the Dawan Formation in the Hubei Province, SW-China. Zhong Guofang (1981) presented a first report of these acritarchs, followed by Lu Li-chang (1987). More recent and current research is that of Tongiorgi and coworkers (Tongiorgi *et al.*, 1992), Brocke (1992), and Yin Leiming (1994). Other studies from SW-China are investigated from assemblages of Arenigian levels of the Meitan Formation, Guizhou Province (Li Jun, 1987) and the Jiuxi Formation, Hunan Province (Li Jun, 1990a, 1990b).

An Early Ordovician assemblage from Central China was investigated by Xing Yusheng (1980). It comes from the Dachengsi Formation of Emeishan, Sichuan Province. Assemblages from Early and Middle Ordovician successions of the Yunnan Province, southern China, were described by Fang Xiaosi (1968a, 1986b) and Gao Lianda (1991).

Late Ordovician acritarchs are recorded in the Changwu Formation of Jiangshan, Zhejiang Province, SE-China (He Sheng-ce & Yin Leiming, 1993). Fielding (1992) announced the results of investigations at the Ordovician-Silurian boundary in the Leijsatun section, Guizhou Province, SW-China.

Ordovician acritarchs from the Shaanxi Province in northern China are studied by Hu Yungxu (1986) and Fu Jiayuan (1986). Li Zaiping (1982) investigated a northern Chinese assemblage of the Machiakou Formation in the Hebei Province. This assemblage was attributed to the Llanvirnian. A further paper on acritarchs from northern China is the contribution of Martin & Yin Leiming (1988), who investigated Early Ordovician assemblages in the Jilin Province.

b) India

A few papers report Ordovician acritarchs from India. Only two were available to the author prior of publication of this index. Prasad & Maithy (1986) recognized *Saharidia* from Krol-e-Beds in the Mussoorie Syncline. Viswanathia *et al.* (1984) described acritarchs from southern Indian dolomites of the Katageri Formation, Badami Group. They were assigned to the Ordovician-Silurian. Although Cambrian to Silurian acritarchs are reported from the Himalaya, the presence of Ordovician specimens is not clearly documented.

c) Pakistan

Recently, the first record of Ordovician acritarchs from northern Pakistan has been published (Tongiorgi *et al.*, 1994; Le Fort *et al.*, 1994). This material is referred to a late early Arenigian to early late Arenigian interval.

d) Iran

Bozorgnia (1973) first reported a few acritarchs from the Alborz Mountain range in northern Iran.

More recently, Ghavidel-Syooki (1990, 1992, 1993) reported Ordovician acritarch assemblages from several areas of northern and south-western Iran. Ghavidel-Syooki (1990) described six biozones from the Chal-i-Sheh area, south-western Iran. The biozones were based on acritarchs and miospores, three of them were attributed to the Ordovician: zone II to the lower Tremadocian; zone III to the Tremadocian-lower Arenigian; zone IV to the upper Arenigian-Llandoverian. In Ghavidel-Syooki (1992), three other zones are described from northern Iran: zone I is attributed to the lower Tremadocian; zone II to a middle to upper Tremadocian interval; zone III to the lower Arenigian. In Ghavidel-Syooki (1993) the assemblages from the Chal-i-Sheh area are reorganized in three acritarch assemblage zones of (I) uppermost Cambrian to lowermost Tremadocian, (II) Tremadocian, and (III) the uppermost Tremadocian age.

e) Turkey

Three papers are available on Turkish Ordovician acritarchs. Erkmen (1979) investigated Lower Palaeozoic acritarchs from SE-Turkey, indicating a "Caradoc-Arenigian" age for the Bedinan Formation, including "reworked Tremadoc" acritarchs.

In Dean & Martin (1992) and Dean *et al.* (1993), new data are given for Tremadocian, Arenigian, and Ashgillian acritarchs of southern Turkey.

f) Arabia, Jordan, and Oman

A few further papers have been published from other countries of the Asian continent. McClure (1988) described briefly the occurrence of chitinozoans and acritarchs in the Ordovician-Silurian portion of the North-West Arabian Palaeozoic stratigraphic section. Three papers are available on material from Jordan. Keegan *et al.* (1990) described five palynozones defined from the Ordovician of the Hashemite Kingdom of Jordan. These zones were attributed to Tremadocian, Llanvirnian, early Ashgillian-Caradocian, and Ashgillian intervals. Basha (1987, 1990) reported some few acritarchs from boreholes of southern and eastern Jordan, respectively.

A short report on acritarchs from Oman is given in Lovelock *et al.* (1981). In this paper, the assemblages investigated from the Amdeh Formation are attributed to an Early to Middle Ordovician age.

2.3.10. Acritarch literature from Australia

Compared with other areas or with other fossil groups, Ordovician acritarchs have been neglected in Australia. Only four papers have been published. Much more data are needed to understand the biostratigraphy and the palaeobiogeography of the acritarchs in this area, which provides magnificent exposures of thick Ordovician strata across hundreds of kilometers.

In a first paper, focused on chitinozoans, Combaz (1965) reported very briefly the occurrence of two acritarchs from core samples from the Georgina Basin, Queensland, East Australia. A futher study was published by Combaz & Péniguel (1972) who investigated some boreholes of the Canning Basin, western Australia. This study was also focused on chitinozoans. The acritarchs were only briefly described.

Two other papers were concentrated on the study of acritarchs. Playford & Martin (1984) described in some detail an acritarch assemblage of a late Arenigian to Llanvirnian (or ?Llandeilian) interval. According to Playford & Martin (1984), this assemblage exhibits little similarity with assemblages from elsewhere. Playford & Wicander (1988) investigated in detail a well-preserved acritarch assemblage from the Lower Ordovician Coolibah Formation from a borehole in the south-eastern Georgina Basin, Queensland.

3. AN INDEX TO ORDOVICIAN ACRITARCH GENERA

The acritarch index of Fensome *et al.* (1990, 1991) gives a very good, nearly complete overview on all acritarch taxa (genera, species, and infraspecific taxa), including all taxa known to the authors by the 1st January 1990. For each individual taxon, Fensome *et al.* (1990) indicated the stratigraphical level from which the type-material was described.

The present list of Ordovician acritarch genera (see Appendix) is based on the index of Fensome *et al.* (1990, 1991) and on the Ordovician acritarch literature mentioned in the present work. Since the 1st January 1990, some further genera have been erected

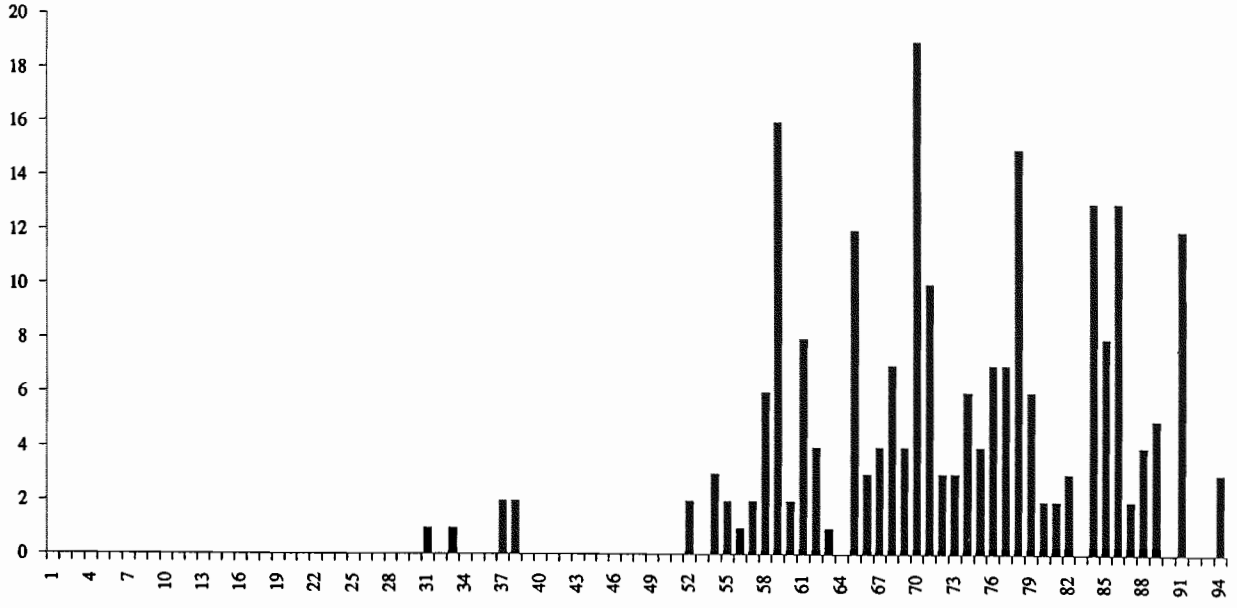

Figure 2. Diagram to show the rate of publication (between 1901 and 1994) of 258 acritarch genera described or cited in the Ordovician Series.

and are included in the present list. Some other genera described earlier were not mentioned in the index of Fensome *et al.* (1990) and are also added. Finally, 22 genera from the present list were not included in the "Fensome" index.

Some genera and species from the (Late) Cambrian and from the (Early) Silurian are also present in the Ordovician. They are included in the present index as well, so that it contains all genera which have been described or are present in Ordovician sediments.

In total, 258 genera are cited in the nearly 700 articles (published by the end of 1994) which are known to the author of the present review. The number of acritarch species used in the Ordovician can only be estimated here. It probably exceeds 2000. Fig. 2. indicates the rates of publication (between 1901 and 1994) of all acritarch genera used in the Ordovician. According to this diagram, the description of new genera diminishes slightly since the mid-1970's. The description of "new" taxa is still continuing, however.
From the over 250 genera, nearly a third (77 genera) remain monospecific. About 30 of them are invalidly published or illegitimate. Some other genera are "waste-baskets" and include numerous (sometimes more than 100) species: *Acanthodiacrodium*, *Baltisphaeridium*, *Micrhystridium*, *Multiplicisphaeridium*, *Veryhachium*; just to name the most important.

The amount of taxa is today so enormous and insurmountable that we are approaching taxonomical chaos. It is difficult, if not impossible, to get or to keep an overview on acritarch literature. The description of new taxa is continuing. Acritarch workers commonly erect specimens as new taxa, simply because they have never seen them before, ignoring (not necessarily intentionally) the previously published literature. This continuous description of "new" taxa, which are unequivocally a redescription of previously erected forms only increases the confused state of acritarch taxonomy instead of clarifying the systematics.
Today, it is indeed very difficult to force one's way through the jungle of acritarch literature.

4. ACKNOWLEDGMENTS

This compilation of publications was only possible with the help of numerous colleagues. I would especially thank M. Vanguestaine (Liège) who provided his collection of articles which constituted the basis of this review. A. Laurant (Unité de Documentation des Sciences de la Terre, Liège) helped finding out articles and reviews from all over the world. Other workers allowed me a look to their collection of reprints: F. Martin (Brussels), Ch. Downie (Sheffield), B. Erdtmann (Berlin), O. Fatka (Prague), A. Le Hérissé (Brest), S. Molyneux (Keyworth/Nottingham), M. Tongiorgi (Pisa); just to name a few. I also thank all colleagues who sent me informations and reprints. Grateful acknowledgment

is expressed especially to R. Brocke (Berlin) and I. Paalits (Tartu, Estonia) for helping in finding articles concerning China and the former Soviet Union. Xu Shaoshun (Beijing) helped in the understanding of Chinese literature. Many thanks to Chris Berry (Cardiff) who made the corrections of the English text. M. Vanguestaine and O. Fatka accepted to review the manuscript. This is a contribution of the Europe-Afrioca Regional Team of IGCP n° 410.

5. REFERENCES

A

AL-AMERI, T.K., 1980. Palynology, Biostratigraphy and Palaeoecology of Subsurface Mid-Palaeozoic strata from the Ghadames Basin, Libya. Unpublished Ph.D. thesis, Department of Geology, Kings College, London: 1-476.

AL-AMERI, T. K., 1986. Observations on the wall structure and the excystment mechanism of acritarchs. *Journal of Micropalaeontology*, 5: 27-35.

ALBANI, R., 1989. Ordovician (Arenigian) acritarchs from the Solanas Sandstone Formation, Central Sardinia, Italy. *Bolletino della Società Paleontologica Italiana*, 28: 3-37.

ALBANI, R., DI MILIA, A., MINZONI, N. & TONGIORGI, M., 1985a. Nuovi dati palinologici e considerazioni geologiche sull'eta' delle Arenarie di Solanas (cambro-ordoviciano - Sardegna centrale). *Atti della Società Toscana di scienze naturali. Memorie*, 91: 1-20.

ALBANI, R., DI MILIA, A. & TONGIORGI, M., 1992. Late Cambrian to Arenigian acritarch findings in the Solanas Sandstone Formation (Nappe Zone, Central Sardinia): a review. Conferencia Internacional Paleozoico Inferior de Ibero-America, Mérida, 8-12 Mayo de 1992. Libro de Resumenes. Publicaciones del Museo de Geologia de Extremadura n°1: 35.

ALBANI, R., LELKES-FELVARY, G. & TONGIORGI, M., 1985b. First record of Ordovician (Upper Arenigian Acritarchs) beds in Bakony Mts., Hungary. *Neues Jahrbuch für Geologie und Paläontologie. Abhandlungen*, 170: 45-65.

ANDRE, L., HERBOSCH, A., LOUWYE, S., SERVAIS, T., VAN GROOTEL, G., VANGUESTAINE, M. & VERNIERS, J., 1991. Guidebook to the excursion on the stratigraphy and magmatic rocks of the Brabant Massif, Belgium. *Annales de la Société Géologique de Belgique*, 114: 283-323.

ANDREEVA, E. M., 1966. Ordovikskie kompleksy spor i drugikh rastitelnykh mikrofossilii SSSR (Ordovician assemblages of spores and other plant microfossils of the USSR). *Trudy VSEGEI nov. ser. Paleofitologija*, 14: 24-30.

ARISTOVA, K.E., 1976. Kompleksy mikrofitofosilii nizhnego i srednego ordovika etalonnykh razrezov Estonii (Assemblages of microplant fossils of Lower and Middle Ordovician type sections in Estonia). Mezhdunarodnaya Palin. Konf. Lucknow, Indiya, 176, Moskva, Trudy, 192: 11-20.

ARISTOVA, K. E., 1980. Etalonnye kompleksy mikrofossilii ordovika i silura Moskovskoi sineklizy. In : Palynology in the USSR. Acadamy of Sciences of the USSR. Fifth International Palynological Conference (Cambridge): 47-49.

ARRIAGHA E CUNHA, T. & VANGUESTAINE, M., 1988. Acritarchs of the "Xistos com Phyllodocites" Formation, Barrancos Region, SE of Portugal. *Comuniaçoes dos Serviços Geologicos de Portugal*, 74: 69-77.

ARTHURTON, R. S. & WADGE, A. J., 1981. Geology of the country around Penrith. *Memoir Geological Survey of Great Britain (England and Wales)*, sheet 24: 1-177.

B

BABIN, C., FEIST, R., MELOU, M. & PARIS, F., 1988. La limite Ordovicien-Silurien en France. *Bulletin British Museum Natural History (Geology)*, 43: 73-79.

BACHMANN, A., 1967. Mikropaleontologische Untersuchungen am Kuckersit-Kalk. *Mikrokosmos*, 12: 371-375.

BAGDASARYAN, L.L., 1965. Mikropaleofitologicheski analiz kembriskikh i ordovikskikh neftei iz Pribaltiki. Palaeontological Congress Novosibirsk, 1965: 110-111.

BAGDASARYAN, L.L., 1967. Fitoplankton iz nizhnepaleozoiskh neftei Pribaltiki. *Inst. Geol. Izdatel' strvo "Nauka" Moskva*: 104-106.

BAGDASARYAN, L. L., 1973. Resultaty mikropaleofitologicheskogo issledovianiya neftei i plastovykh vod. Proceedings of the Third International Palynological Conference, Novosibirsk: 62-67.

BAGNOLI, G., STOUGE, S. & TONGIORGI, M., 1988. Acritarchs and conodonts from the Cambro-Ordovician Furuhäll (Köpingsklint) section (Öland, Sweden). *Rivista Italiana di Paleontologia e Stratigrafia*, 94: 163-248.

BÄR, P., 1977. Geologische Entwicklung der jungpräkambrisch-altpalözoischen Schichtfolgen im südlichen Randgebiet des Volta-Beckens (Ghana, W-Afrika). *Giessener Geologische Schriften*, 12: 21-56.

BÄR, P. & RIEGEL, W., 1980. Mikrofloren des höchsten Ordovizium bis tiefen Silurs aus der Unteren

Sekondi-Serie von Ghana (Westafrika) und ihre Beziehung zu den Itaim-Schichten des Maranhao-Beckens in NE-Brasilien. *Neues Jahrbuch für Geologie und Paläontologie. Abhandlungen*, 160: 42-60.

BARCA, S., COCOZZA, T., DEL RIO, M., PILLOLA, L. & PITTAU DEMELIA, P., 1987. Datation de l'Ordovicien inférieur par *Dictyonema flabelliforme* et Acritarches dans la partie supérieure de la formation "Cambrienne" de Cabitza (SW de la Sardaigne, Italie) : conséquences géodynamiques. *Comptes Rendus de l'Académie des Sciences de Paris*, 305: 1109-1113.

BARCA, S., COCOZZA, T., DEL RIO, M. & PITTAU DEMELIA, P., 1981. Discovery of Lower Ordovician Acritarchs in the "Postgotlaniano" sequence of southwestern Sardinia (Italy): age and tectonic implications. *Bolletino della Società Paleontologica Italiana*, 100: 377-392.

BARCA, S., DEL RIO, M., MINZONI, N. & PITTAU DEMELIA, P., 1984. Presenza di Tremadociano ad acritarchi in unita' tettoniche erciniche a sud del Lago di Mulargia (Sardegna centrale). *Rivista Italiana di Paleontologia e Stratigrafia*, 89: 315-334.

BARCA, S., DEL RIO, M. & PITTAU DEMELIA, P., 1989. New geological and stratigraphical data and discovery of Lower Ordovician acritarchs in the San Vito Sandstone of the Genn'Argiolas Unit (Sarrabus, Southeastern Sardinia). *Rivista Italiana di Paleontologia e Stratigrafia*, 94: 339-360.

BARKER, G.W. & MILLER, M.A., 1990. Tremadocian (Lower Ordovician) acritarchs from the subsurface of West Texas. *Palynology*, 14: 209.

BARRON, H.F., 1991. *Moyeria cabottii* from the Ordovician of Wales, United Kingdon. *Palynology*, 15: 237.

BARRON, H.F. & MOLYNEUX, S.G., 1992. Acritarchs from Ashgill Series (Ordovician) of the UK. Abstracts 8th International Palynological Congress, Aix-en-Provence: 9.

BASHA, S. H., 1987. Acritarchs from Ordovician rocks in south Jordan. *Revue de Micropaléontologie*, 30: 145-149.

BASHA, S.H., 1990. Palynomorphs from Ordovician-Silurian subsurface rocks of Wadi Sirhan, East Jordan. *Revista Española de Micropaleontologia*, 22: 137-141.

BAUDELOT, S. & BESSIERE, G., 1975. Découverte d'Acritarches d'âge Ordovicien inférieur dans le massif de Mouthoumet (Aude). *Comptes Rendus sommaires de la Société Géologique de France*, 17: 171-173.

BAUDELOT, S. & BESSIERE, G., 1977. Données palynostratigraphiques sur le Paléozoique inférieur du Massif du Mouthoumet (Hautes Corbières, Aude). *Annales de la Société Géologique du Nord*, 117: 21-25.

BAUDELOT, S., BOUILLIN, P. & COIFFAIT, P., 1981. Découverte d'Ordovicien inférieur daté par Acritarches dans l'Ouest de la Petite Kabylie (Algérie); conséquences structurales. *Comptes Rendus de l'Académie des Sciences de Paris*, 293: 611-614.

BAUDELOT, S., DOUBINGER, J., DURAND DELGA, M. & VELLUTINI, P., 1976. Caractéristiques et âges des cinq cycles paléozoiques du Nord-Ouest de la Corse. *Bulletin de la Société Géologique de France*, 7ème série, 18: 1221-1228.

BAUDELOT, S. & FOURNIER-VINAS, C., 1984. Bassins paléozoïques cachés sous l'Aquitaine: étude micropaléontologique de carottes prélevées à l'occasion de forages pétroliers. *Documents B.R.G.M.*, 81-7: 1-11.

BAUDELOT, S. & GERY, B., 1979. Découverte d'Acritarches du Cambrien supérieur et du Trémadoc dans le massif ancien de Grande Kabylie (Algérie). *Comptes Rendus de l'Académie des Sciences de Paris*, 288: 1513-1516.

BEJU, D., 1964. Noi date palinoligice referitoare la Paleozoicul din Platforma Moesica (nota preliminara). *Petrol si Gase*, 15 (9): 465-468.

BEJU, D., 1971. Contributii la studiul palino-protistologic al paleozoicului din platforma moesica. Centrul de multiplicare al Universitatii "Al.I.Cuza" din Iasi.

BEJU, D., 1972. Zonare si corelare a Paleozoicului din Platforma Moesica pe baza asociatiilor palino-protistologice. I. *Petrol si Gaze*, 23: 714-722.

BEJU, D., 1973. Zonare si corelare a Paleozoicului din Platforma Moesica pe baza asociatiilor palino-protistologice. II. *Petrol si Gaze*, 24: 10-14.

BOCKELIE, T. G. & KJELLSTRÖM, G., 1979. Middle Ordovician acritarchs from the island of Odinsholm, Estonia. *Geologiska Förneningens i Stockholm Förhandlingar*, 101: 205-216.

BOGOMJAGKOVA, V. B., 1973. Lower Paleozoic acritarchs and their signifiance for the stratigraphy of Paleozoic deposits of the Lvov depression. Proceedings of the Third International Palynological Conference, Novosibirsk: 36-39.

BONA, J., 1972. Report on the palynological investigation of the borehole Szabattyan-9. Hungarian Geological Survey (manuscript).

BOOTH, G.A., 1979. Lower Ordovician acritarchs from successions in England and North Wales. Unpublished Ph.D. Thesis, University of Sheffield, U.K.: 1-383.

BOOTH, G. A., DORNING, K. J., HILL, P. J.,

POTTER, T. L., RASUL, S. M. & TURNER, R. E., 1984. Lower Palaeozoic acritarch distribution in the British Isles. Abstracts, 6th International Palynological Conference, Calgary.

BOOTH, G. A., MOLYNEUX, S. G. & RASUL, S. M., 1980. Palynomorphs and the Cambrian/Ordovician boundary. Abstracts, 5th International Palynological Conference, Cambridge: 52.

BOROVKO, N.G., SERGEEVA, S.P., VOLKOVA, N.A., GOLUB, I.N., GORYANSKII, V.Y., POPOV, L.E. & KHAZANOVICH, K.K., 1984. Opornyi razrez pogranichnykh otlozhenii kembriya i ordovika severo-zapada Russkoi plity (r Izhora). The type section of the Cambrian-Ordovicain boundary beds, NW of the Russian Platform. *Academiya Nauk SSSR, Izvestiya, Seriya Geologicheskaya*, 7: 54-63.

BOUILLIN, J.P, BAUDELOT, S. & MAJESTE-MENJOULAS, C., 1984. Mise en évidence du Cambro-Ordovicien en Calabre centrale (Italie). Affinités paléogéographiques et conséquences structurales. *Comptes Rendus de l'Académie des Sciences de Paris*, 298: 89-92.

BOUILLIN, J.P., MAJESTE-MENJOULAS, C., BAUDELOT, S., CYGAN, C. & FOURNIER-VINAS, C., 1987. Les formations Paléozoiques de l'Arc Calabro-Péloritain dans leur cadre structural. *Bolletino della Società Geologica Italiana*, 106: 683-698.

BOZORGNIA, F., 1973. Paleozoic foraminiferal biostratigraphy of central and east Alborz Mountains, Iran. *National Iranian Oil Company. Geological Laboratories Publication*, 4: 1-166.

BROCKE, R., 1992. First results of palynological investigations of the lower Arenig from the Yangtze platform, China. Abstracts, 8th International Palynological Congress, Aix-en-Provence: 18.

BROCKE, R., FATKA, O., & SERVAIS, T., 1994. *Aureotesta* Vavrdova 1972 and *Marrocanium* Cramer *et al.* 1974 - one single taxon? Contributions to the CIMP Symposium on Palynology, Palaeoenvironments and Stratigraphy, 6-10 September 1994, University of Sheffield, England: 49.

BRÜCK, P. M., 1971. Fossil content and age of the greywacke formations west of the Leinster Granite in Counties Dublin, Kildare and Wicklow, Ireland. *Geological Magazine*, 108: 303-310.

BRÜCK, P. M., COLTHRUST, J. R. J., FEELY, M., GARDINER, P. R. R., PENNEY, S. R., REEVES, T.J., SHANNON, P. M., SMITH, D. G. & VANGUESTAINE, M., 1979. South-east Ireland: Lower Palaeozoic stratigraphy and depositional history. *In*: HARRIS, A.L., HOLLAND, C.H. & LEAKE, B.E (eds.). The Caledonides of the British Isles - reviewed. The Geological Society (London): 533-544.

BRÜCK, P. M., POTTER, T. C. & DOWNIE, C., 1974. The Lower Paleozoic stratigraphy of the Northern part of the Leinster Massif. *Proceedings of the Royal Irish Academy*, 74: 75-84.

BULMAN, O.M.D. & RUSHTON, A.W.A., 1973. Tremadoc faunas from boreholes in Central England. *Bulletin of the Geological Survey of Great Britain*, 43: 1-40.

BULTYNCK, P. & MARTIN, F., 1982. Conodontes et acritarches de l'Ordovicien inférieur et acritarches du Silurien inférieur de la partie septentrionale de la cordillère argentine. *Bulletin de l'Institut royal des Sciences naturelles de Belgique*, 53 (4): 1-19.

BUNNER, W. D. & LEGAULT, J. A., 1988. The effects of paleoenvironmental conditions on the occurrence of palynomorphs in the Lower Gull River Formation (Middle Ordovician) of Southwestern Ontario. *Palynology*, 12: 232-233.

BUNNER, W. D. & LEGAULT, J. A., 1989. A new species of *Dicommopalla* (acritarcha) from the Middle Ordovician Simcoe Group of southern Ontaria, Canada. *Palynology*, 13: 57-62.

BURMANN, G., 1965. Zum Nachweis von Mikroplankton in tektonisch beanspruchten Gebieten. *Abhandlungen Zentral Geologisches Institut*, 1: 303-313.

BURMANN, G., 1968. Diacrodien aus dem unteren Ordovizium. *Paläontologische Abhandlungen*, II. 4: 635-652.

BURMANN, G., 1969. Inkohlung und mechanische Deformation. *Zeitschrift für angewandte Geologie*, 15: 355-363.

BURMANN, G., 1970. Weitere organische Mikrofossilien aus dem unteren Ordovizium. *Paläontologische Abhandlungen. Abteilung B. Paläobotanik*, III. 3/4: 289-332.

BURMANN, G., 1973a. Organische Mikrofossilien im Vor- und Altpaläozoikum der DDR. *Abhandlungen Zentral Geologisches Institut*, 18: 125-127.

BURMANN, G., 1973b. Chitinozoen aus dem Arenig. *Abhandlungen Zentral Geologisches Institut*, 18: 129-159.

BURMANN, G., 1973c. Hinweise zur systematischen Stellung der Diacrodien. *Abhandlungen Zentral Geologisches Institut*, 18: 161-191.

BURMANN, G., 1973d. Vorläufige Mitteilung über das Ordovizium in der nördlichen Phyllitzone. *Zeitschrift geologischer Wissenschaften*, 1.6: 739-740.

BURMANN, G., 1973e. Das Ordovizium der nördlichen Phyllitzone: Teil 1: Paschlebener Vorsprung. *Zeitschrift geologischer Wissenschaften*, 1.7: 757-787.

BURMANN, G., 1973f. Das Ordovizium der nördlichen Phyllitzone: Teil 2: Wippraer Zone. *Zeitschrift geologischer Wissenschaften Themenhefte*, 1: 9-43.
BURMANN, G., 1976. Übersicht über das ordovizische Mikroplankton im Südteil der DDR (Vogtland, Wildenfelser Zwischengebirge). *Jahrbuch für Geologie*, 7/8: 47-62.
BURMANN, G. & WASKOWIAK, R., 1968. Zur Einstufung des Griffelschiefers auf Blatt Kirchberg-Wildenfels. *Geologie mit Beiheften*, 17: 1116.

C

CATOT, E. & VANGUESTAINE, M., 1992. Biostratigraphie par acritarches du Trémadocien du Massif de Stavelot. Abstracts, 8th International Palynological Congress, Aix-en-Provence: 23.
CHAUVEL, J.J., DEUNFF, J. & LE CORRE, C., 1970. Découverte d'une association minerai de fer-microplancton dans l'Ordovicien du flanc nord du Bassin de Laval (Mayenne): étude pétrographique et micropaléontologique. *Comptes Rendus de l'Académie des Sciences de Paris*, 270: 1219-1222.
CHEN, J.Y, QIAN, Y.Y, ZHANG, J.M., LIN, Y.K., YIN, L.M., WANG, Z.H., WANG, Z.Z, YANG, J.D. & WANG Y.X., 1988. The recommended Cambrian-Ordovician global Boundary stratotype of the Xiaoyangiao section (Dayangcha, Jilin Province), China. *Geological Magazine*, 125: 415-444.
CHIBRIKOVA, E.V., 1972. Ordovik na yugo-vostoke Russkoi platformy (Ordovician in the SW of the Russian Platform). *In*: Stratigrafiya i Paleontologiya Dokembriya i Paleozoya Yuzhnogo Urala i Priuralya. Voprosy Geologii Vostochnoi Okrainy Russkoi platformy i Yuzhnogo Urala. Akademiya Nauk SSSR, Bashkirskii Filial, Institut Geologii, 16: 15-17.
CLAYTON, G., JOHNSTON, I. S., SEVASTOPULO, G. D. & SMITH, D. G., 1980. Micropalaeontology of a Courceyan (Carboniferous) borehole section from Ballyvergin, County Clare, Ireland. *Journal of Earth Sciences of the Royal Dublin Society*, 3: 81-100.
COCCHIO, A. M., 1981. Microflores des séries du Paléozoique inférieur du Massif du Mouthoumet (Corbières, Aude). *Travaux du Laboratoire de Géologie Méditerranéenne Associé au C.N.R.S., Université Paul-Sabatier, Toulouse*: 1-132.
COCCHIO, A. M., 1982. Données nouvelles sur les acritarches du Trémadoc et de l'Arénig dans le massif de Mouthoumet (Corbières, France). *Revue de Micropaléontologie*, 25: 26-38.
COLBATH, G. K., 1979. Organic-walled microphytoplankton from the Eden shale (Upper Ordovician), Indiana, U.S.A. *Palaeontographica Abteilung B*, 171: 1-38.
COLBATH, G. K., 1980. Abundance fluctuations in Upper Ordovician organic-walled microplankton from Indiana. *Micropaleontology*, 26: 97-102.
COLBATH, G. K., 1981. Synonymy of Edenian (late Ordovician) organic-walled microphytoplankton taxa. *Journal of Paleontology*, 55: 273-274.
COLBATH, G.K., 1983. Palaeoecology of palynomorphs from the Upper Ordovician-Lower Silurian of the southern Appalachians, U.S.A. Unpublished Ph.D. thesis, University of Oregon, United States.
COLBATH, G.K., 1984. Excystment structures as paleoenvironmental indicators in fossil organic-walled phytoplankton. *Palynology*, 8: 235.
COLBATH, G.K., 1986a. The lower Paleozoic organic-walled phytoplankton ("acritarch") genus *Frankea* Burmann 1970. *Micropaleontology*, 32: 72-73.
COLBATH, G.K., 1986b. Abrupt terminal Ordovician extinction in phytoplankton associations, southern Appalachians. Geology, 14: 943-946.
COLBATH, G.K., 1989. Systematics and biostratigraphy of organic-walled phytoplankton from the Upper Ordovician and Lower Silurian of the southern Appalachians. *Palynology*, 13.
COLBATH, G.K., 1990. Palaeobiogeography of Middle Palaeozoic organic-walled phytoplancton. *In*: Palaeogeography and biogeography, McKERROW, W. S. & SCOTESE, C. R. (eds.), London, Geological Society memoir, 12: 207-213.
COLTHRUST, J. R. J. & SMITH, D. G., 1977. Palaeontological evidence for the age of the Lower Palaeozoic rocks of the Slievenamon Inlier, County Tipperary. *Proceedings of the Royal Irish Academy*, 77: 143-158.
COMBAZ, A., 1964. Les palynofacies. *Revue de Micropaléontologie*, 7: 205-218.
COMBAZ, A., 1965. Un microbios à Chitinozoaires dans le Paléozoïque du Queensland (Australie). *Comptes Rendus de l'Académie des Sciences de Paris*, 260: 3449-3451.
COMBAZ, A., 1966. Remarques sur les niveaux à tasmanacées du Paléozoique saharien. *The Paleobotanist*, 15: 29-34.
COMBAZ, A., 1967a. Leiosphaeridaceae Eisenack, 1954, et Protoleiosphaeridae Timofeev, 1959 - leurs affinités, leur rôle sédimentologique et géologique. *Review of Palaeobotany and Palynology*, 1: 309-321.
COMBAZ, A., 1967b. Sur un microbios d'âge Trémadocien à Hassi-Messaoud. *Actes de la Société Linéenne de Bordeaux*, vol. sp. Congrès AFAS: 115-119.
COMBAZ, A., 1968. Un microbios du Trémadocien

dans un sondage d'Hassi-Messaoud. *Actes de la Société Linnéenne de Bordeaux*, 104: 1-26.
COMBAZ, A., LANGE, W. & PANSART, J., 1967. Les "Leiofusidae" Eisenack, 1938. *Review of Palaeobotany and Palynology*, 1: 291-307.
COMBAZ, A. & PENIGUEL, G., 1972. Etude palynostratigraphique de l'Ordovicien dans quelques sondages du Bassin de Canning (Australie occidentale). *Bulletin du Centre de Recherches de Pau* - SNPA, 6.1: 121-167.
COOPER, A. H. & MOLYNEUX, S. G., 1990. The age and correlation of Skiddaw Group (Early Ordovician) sediments in the Cross Fell inlier (northern England). *Geological Magazine*, 127: 147-157.
CORNA, O., 1969. Bemerkungen zur Verbreitung palynologischer Mikrofossilien vom Präkambrium bis zum Unterkarbon. *Geologicky Sbornik Bratislava*, 20: 399-416.
CORNA, O., 1970. Plant remains in the Ordovician of the Bohemian Massif. *Geologicky Sbornik Bratislava*, 21: 113-186.
CRAMER, F. H., 1974. Palynostratigraphy of Lower Paleozoic rocks in Jebel Basin Region and Kasba Tadla Basin, South Morocco. *Geoscience and Man*, 8.
CRAMER, F. H., ALLAM, B., KANES, W. H. & DIEZ, M., 1974a. Upper Arenigian to lower Llanvirnian acritarchs from the subsurface of the Tadla Basin in Morocco. *Palaeontographica Abteilung B*, 145: 182-190.
CRAMER, F. H. & DIEZ, M., 1972. Lower Palaeozoic palynomorph provinces and paleoclimate. Published Abstracts of the S.E.P.M.-A.A.P.G.-Meeting, Denver, Colorado, April 1972: 611.
CRAMER, F. H. & DIEZ, M., 1974. Early Paleozoic palynomorph provinces and paleoclimate. *In*: Paleogeographic provinces and provinciality, ROSS, C. A. (ed.), Society of Economic Paleontologists and Mineralogists, special publication, 21: 177-188.
CRAMER, F. H. & DIEZ, M., 1975. Thermal alteration of palynomorphs indicates abse nce of liquid hydrocarbons in Djebel Bani, Southern Morocco. *Neues Jahrbuch für Geologie und Paläontologie. Monatshefte*, 1975-9: 513-516.
CRAMER, F. H. & DIEZ, M., 1976a. Seven new late Arenigian species of the Acritarch Genus *Coryphidium*. *Paläontologische Zeitschrift*, 50: 201-208.
CRAMER, F. H. & DIEZ, M., 1976b. Palynology suggests hydrocarbon mobilization in Ordovician of Kasba Tadla Basin, Morocco. *Geologische Rundschau*, 65: 288-290.
CRAMER, F. H. & DIEZ, M., 1977a. Late Arenigian (Ordovician) acritarchs from Cis-Saharan Morocco. *Micropaleontology*, 23: 339-360.
CRAMER, F. H. & DIEZ, M., 1977b. Lower Paleozoic phytoplancton from North Africa and adjacent regions. General Survey. *Annales des mines et de la Géologie*, 28: 21-34.
CRAMER, F. H. & DIEZ, M., 1979. Lower Paleozoic acritarchs. *Palinologia*, 1: 17-160.
CRAMER, F. H., KANES, W. H., DIEZ, M. & CHRISTOPHER, R. A., 1974b. Early Ordovician acritarchs from the Tadla Basin of Morocco. *Palaeontographica Abteilung B*, 146: 57-64.

D

DEAN, W. T. & MARTIN, F., 1978. Lower Ordovician acritarchs and trilobites from Bell Island, Eastern Newfoundland. *Bulletin of the Geological Survey of Canada*, 284: 1-35.
DEAN, W. T. & MARTIN, F., 1982. The sequence of trilobite faunas and acritarch microfloras at the Cambrian-Ordovician boundary, Wilcox Pass, Alberta, Canada. *In*: BASSETT, M. G. & DEAN, W. T. (eds.), The Cambrian-Ordovician boundary: sections, fossil distributions, and correlations. Cardiff, National Museum of Wales, Geological Series, 3: 131-140.
DEAN, W. T. & MARTIN, F., 1992. Ordovician biostratigraphic correlation in southern Turkey. *In*: WEBBY, B.D. & LAURIE, J.R. (eds.), Global Perspectives on Ordovician Geology, Balkema: 195-203.
DEAN, W. T., MARTIN, F., MONOD, O., GÜL, M.A., BOZDOGAN, N., & ÖZGÜL, N., 1993. Early Palaeozoic Evolution of the Gondwanaland margin in the western and central Taurids, Turkey. *In*: TURGUT, S. (ed.), Tectonics and Hydrocarbon Potential of Anatolia and surrounding Regions. Ozan Sungurlu Symposium Proceedings, November 1991, Ankara: 262-273.
DEFLANDRE, G., 1942. Sur les Hystrichosphères des calcaires siluriens de la Montagne Noire. *Comptes Rendus de l'Académie des Sciences de Paris*, 215: 475-476.
DEFLANDRE, G., 1945. Microfossiles des calcaires siluriens de la Montagne Noire. *Annales de Paléontologie*, 31: 41-75.
DEFLANDRE, G. & DEFLANDRE, M., 1962. Nomenclature et systématique des Hystrichosphères (sens. lat.) Observations et Rectifications. *Revue de Micropaléontologie*, 4: 190-196.
DEFLANDRE, G. & DEFLANDRE, M., 1964a. Fichier micropaléontologique général - Série 12. *Archives originales du Centre de Documentation C.N.R.S.*: 1-392.
DEFLANDRE, G. & DEFLANDRE, M., 1964b.

Notes sur les acritarches. *Revue de Micropaléontologie*, 7: 111-114.
DEFLANDRE, G. & DEFLANDRE, M., 1965a. Fichier micropaléontologique général - Série 13. *Archives originales du Centre de Documentation C.N.R.S.*: 1-402.
DEFLANDRE, G. & DEFLANDRE, M., 1965b. Remarques critiques sur le genre *Micrhystridium* Deflandre. *Revue de Micropaléontologie*, 8: 85-89.
DEFLANDRE, G. & SARJEANT, W. A. S., 1970. Nouvel examen de quelques holotypes de Dinoflagellés fossiles et d'Acritarches. *Archives originales du Centre de Documentation C.N.R.S.*, 466: 1-10.
DEFLANDRE, G. & TERS, M., 1966. Sur la présence d'Acritarches Ordoviciens dans les schistes subardoisiers de la région de la Mothe-Achard (Vendée). Extension du Silurien (grés armoricain et schistes d'Angers) en Vendée littorale. *Comptes Rendus de l'Académie des Sciences de Paris*, 262: 237-240.
DERBY, J.R., BAUER, J.A., CREATH, W.B., DRESBACH, R.I., ETHINGTON, R.L., LOCH, J.D., STITT, J.H., McHARGUE, T.R., MILLER, J.F., MILLER, M.A., REPETSKY, J.E., SWEET, W.C., TAYLOR, J.F. & WILLIAMS, M., 1991. *In*: JOHNSON, K.S. (ed.), Late Cambrian-Ordovician Geology of the Southern Midcontinent, 1989 Symposium. *Oklahoma Geological Survey Circular*, 92: 15-41.
DESTEUCQ, C. & FOURNIER-VINAS, C., 1982. Présence d'Ordovicien daté dans la région d'Oujda (Maroc oriental). *Mines Géologie Energie*, 52: 113-116.
DEUNFF, J., 1951. Sur la présence de microorganismes (Hystrichosphères) dans les schistes ordoviciens du Finistère. *Comptes Rendus de l'Académie des Sciences de Paris*, 233: 321-323.
DEUNFF, J., 1954. *Veryhachium*, genre nouveau d'Hystrichosphères du Primaire. *Comptes Rendus sommaires de la Société Géologique de France*, 13: 305-306.
DEUNFF, J., 1955. *Aremoricanium*, genre nouveau d'Hystrichosphères du Silurien breton. *Comptes Rendus sommaires de la Société Géologique de France*, 11-12: 227-229.
DEUNFF, J., 1956. Progrès récents de nos connaissances sur les microplanctons fossiles à Hystrichosphères des mers primaires. *Grana Palynologica*, 1: 79-83.
DEUNFF, J., 1959. Microorganismes planctoniques du Primaire armoricain. 1. - Ordovicien de Veryhac'h (presqu'île de Crozon). *Bulletin de la Société Géologique et Minéralogique de Bretagne*, 2: 1-40.
DEUNFF, J., 1961. Un microplancton à hystrichosphères dans le Trémadoc du Sahara. *Revue de Micropaléontologie*, 4: 37-52.
DEUNFF, J., 1964. Systématique du microplancton fossile à acritarches. Révision de deux genres de l'Ordovicien inférieur. *Revue de Micropaléontologie*, 7: 119-124.
DEUNFF, J., 1968a. Sur une forme nouvelle d' Acritarche possédant une ouverture polaire (*Veryhachium miloni* n. sp.) et sur la présence d'une colonie de *Veryhachium* dans le Trémadocien marocain. *Comptes Rendus de l'Académie des Sciences de Paris*, 267: 46-49.
DEUNFF, J., 1968b. *Arbusculidium*, genre nouveau d'acritarche du Trémadocien marocain. *Comptes Rendus sommaires de la Société Géologique de France*, 3: 101-102.
DEUNFF, J., 1969. Sur la présence d'Acritarches au sommet des schistes de l'Ordovicien moyen du Sud de Rennes. *Bulletin de la Société Géologique et Minéralogique de Bretagne*, 1: 45-48.
DEUNFF, J., 1971. Le genre *Polyedrixium*. *In*: JARDINE, S. (ed.), Microfossiles organiques du Paléozoique, Editions du Centre National de la Recherche Scientifique: 7-49.
DEUNFF, J. 1975. Datation des formations briovériennes et paléozoïques de Bretagne par le microplancton. *Geobios*, 8: 222-224.
DEUNFF, J., 1977. Un microplancton à Acritarches dans les schistes llanvirniens de l' Anti-Atlas (Zagora-Maroc). *Notes du Service géologique du Maroc*, 38: 141-151.
DEUNFF, J., 1980. Les schistes et calcaires de l'Armorique: les Acritarches. *Mémoires de la Société Géologique et Minéralogique de Bretagne*, 23-317: 103-108.
DEUNFF, J., AUVRAY, B., COGNE, J., HAMEURT, J., JEANETTE, D. & VIDAL, P., 1973. Confirmation micropaléontologique de l'âge radiométrique ordovicien inférieur du groupe spilitique d'Erquy (Côte-du-Nord). *Comptes Rendus de l'Académie des Sciences de Paris*, 276: 935-937.
DEUNFF, J. & CHAUVEL, J. J., 1970. Un microplancton à chitinozoaires et acritarches dans des niveaux schisteux du grés armoricain (Mayenne et Sud de Rennes). *Comptes Rendus sommaires de la Société Géologique de France*, 6: 196.
DEUNFF, J., GORKA, H. & RAUSCHER, R., 1974. Observations nouvelles et précisions sur les acritarches à large ouverture polaire du Paléozoique inférieur. *Geobios*, 7: 5-18.
DEUNFF, J. & MASSA, D., 1975. Palynologie et stratigraphie du Cambro-Ordovicien (Libye nord-occidentale). *Comptes Rendus de l'Académie des*

Sciences de Paris, 281: 21-24.

DEUNFF, J. & PARIS, F., 1970. Remarques concernant l'ouverture polaire de certains acritarches. *Bulletin de la Société Géologique et Minéralogique de Bretagne*, II: 105-107.

DIEZ, M. & CRAMER, F. H., 1974. Range chart of selected Lower Paleozoic acritarch taxa. *Review of Palaeobotany and Palynology*, 18: 155-170.

DIEZ, M. & CRAMER, F. H., 1977. Range chart of selected Lower Paleozoic acritarch taxa. II. Index to parts I and II. *Review of Palaeobotany and Palynology*, 24: 1-48.

DIEZ, M. & GUTIERREZ, M., 1979. Paleopalynology and Palynostratigraphy of Spain: Bibliographic References to 1979. *Palinologia*, 1: 293-306.

DIEZ BALDA, M. A. & FOURNIER-VINAS, C., 1981. Hallazgo de acritarchos en el comlejo esquisto-grauvaqico al sur de Salamanca. *Acta Geologica Hispanica*, 16: 131-134.

DI MILIA, A., 1988. Stratigrafia del Cambro-Ordoviciano della Sardegna Centrale (Arenarie di Solanas - Unità de Meano Sardo). Unpublished doctoral thesis, Dipartimento di Scienze della Terra, Università di Pisa: 1-326.

DI MILIA, A. & TONGIORGI, M., 1991. Reworked Palynomorphs in the Solanas Sandstone (Central Sardinia) and their significance for the basin analysis. Geologia del Basamento Italiano, Convegno in memoria di T. Cocozza, abstracts: 36-37.

DI MILIA, A. & TONGIORGI, M., 1992. Reworked Palynomorphs in the Solanas Sandstone (Central Sardinia) and their significance for the basin analysis. *In*: CARMIGNANI, L. & SASSI, F.P. (eds.), Contributions to the Geology of Italy with special regard to the Paleozoic basements. A volume dedicated to Tommaso Cocozza. IGCP No. 276, Newsletter Vol. 5, Siena 461-463.

DI MILIA, A. & TONGIORGI, M., 1993. Tremadocian acritarch assemblages from the Solanas Sandstone Formation (Nappe Zone of Central Sardinia). *Memoria della Societa Geologica Italiana*, 49: 193-204.

DI MILIA, A., TONGIORGI, M., & ALBANI, R., 1993. Acritarch findings in Early Palaeozoic, low-grade metasediments of Sardinia (Italy): a review. *Revista Espanola de Paleontologia*, 8: 170-176.

DORNING, K. J., 1985. Acritarch microflora from the Ordovician of North Glen Sannox, Isle of Arran, Scotland. *British Lower Palaeozoic Palynomorph Working Group Report*, 1985: 9-13.

DORNING, K.J., 1991. Late Ordovician and Silurian sequence stratigraphy, acritarch associations and chitinozoan assemblages of the Welsh Basin, England and Wales. Abstracts. C.I.M.P. Acritarch and Chitinozoa Subcommissions. Symposium on Acritarchs and Chitinozoa, British Geological Survey, Keyworth, Nottingham, U.K., 3-6 September 1991.

DORNING, K.J., 1994a. Acritarch and chitinozoan distribution in Palaeozoic depositional sequences. Contributions to the CIMP Symposium on Palynology, Palaeoenvironments and Stratigraphy, 6-10 September 1994, University of Sheffield, England: 15.

DORNING, K.J., 1994b. *Dactylofusa*, *Eupoikilofusa*, *Leiofusa* and *Poikilofusa*: four fusiform acritarch genera. Contributions to the CIMP Symposium on Palynology, Palaeoenvironments and Stratigraphy, 6-10 September 1994, University of Sheffield, England: 15.

DORNING, K. J. & HUTTER, T. J., 1984. Lower Palaeozoic acritarchs from Florida, U.S.A. Abstracts, 6th International Palynological Conference Calgary.

DOWNIE, C., 1958. An assemblage of Microplankton from the Shineton Shales (Tremadocian). *Proceedings of the Yorkshire Geological Society*, 31: 331-350.

DOWNIE, C., 1960. *Deunffia* and *Domasia*, new genera of hystrichospheres. *Micropaleontology*, 6: 197-202.

DOWNIE, C., 1967. The geological history of the Microplankton. *Review of Palaeobotany and Palynology*, 1: 269-281.

DOWNIE, C., 1973. Observations on the nature of the acritarchs. *Palaeontology*, 16: 239-259.

DOWNIE, C., 1984. Acritarchs in British Stratigraphy. *Geological Society London, special report*, 17: 1-26.

DOWNIE, C., BOOTH, G., RASUL, S. & POTTER, T., 1979. Changes in the acritarch assemblages at the Tremadoc boundaries in the United Kingdom. Proceedings of the IV International Palynological Conference Lucknow (76-77), 2: 78-83.

DOWNIE, C., CRAMER, F. H., EVITT, W. R., JANSONIUS, J., STAPLIN, F. L. & POCOCK, J., 1968. Microfossiles organiques du Paléozoique. (3) Les acritarches; Morphographie. C.I.M.P. (subgroup acritarchs) unpublished report: 1-19.

DOWNIE, C., EVITT, W. R. & SARJEANT, W. A. S., 1963. Dinoflagellates, Hystrichospheres and the classification of the Acritarches. *Stanford University Publications. Geological Sciences*, 7: 1-16.

DOWNIE, C. & FORD, T. D., 1966. Microfossils from the Manx Slate Series. *Proceedings of the Yorkshire Geological Society*, 35: 307-322.

DOWNIE, C., LISTER, T. R., HARRIS, A. L. & FETTES, D. J., 1971. A palynological investigation of the Dalradian rocks of Scotland. *Report Natural*

Environment Research Council, Institute of Geological Sciences, 71/9: 1-29.
DOWNIE, C. & SARJEANT, W. A. S., 1963. On the interpretation and status of some hystrichosphere genera. *Palaeontology*, 6: 83-96.
DOWNIE, C. & SARJEANT, W. A. S., 1964. Bibliography and index of fossil dinoflagellates and acritarchs. *The Geological Society of America. Memoir*, 94: 1-180.
DOWNIE, C. & SOPER, N. J., 1972. Age of the Eycott Volcanic Group and its conformable relationship to the Skiddaw Slates in the English Lake District. *Geological Magazine*, 103: 259-268.
DOWNIE, C. & TREMLETT, W. E., 1968. Micropaleontological evidence on the age of the Clara Group (South East Ireland). *Geological Magazine*, 105: 401.
DROBKOVA, E. L. & ORLOVA, R. M., 1966. Spory Ordovikskikh otlozheniy Irkutskogo Amfiteatra (Spores in the Ordovician rocks of the Irkutsk Aphitheatre). Minist. Geol. RSFSR.
DUFFIELD, S.L., 1982. Late Ordovician - Early Silurian acritarch biostratigraphy and taxonomy, Anticosti Island, Québec. Unpublished Ph. D., University of Waterloo, Ontario, Canada: 1-338.
DUFFIELD, S.L. & LEGAULT, J.A., 1981. Acritarch biostratigraphy of Upper Ordovician-Lower Silurian rocks, Anticosti Island, Québec : Preliminary results. *In*: LESPERANCE, P.J. (ed.). Subcommission on Silurian Stratigraphy, Ordovician-Silurian Boundary Working Group. Field Meeting, Anticosti-Gaspé, Québec 1981, Vol. II : Stratigraphy and Paleontology: 91-99.
DUFFIELD, S.L. & LEGAULT, J.A., 1982. Gradational morphological series in Early Silurian acritarchs from Anticosti Island, Quebec. Third North American Paleontological Convention, Proceedings, vol. I: 137-141.
DUFKA, P., 1990. Palynomorphs in the Llandovery black shale sequence of the Prague Basin (Barrandian area, Bohemia). Casopsis pro mineralogii a geologii, 35: 15-31.
DUFKA, P., & FATKA, O., 1991. Chitinozoans and acritarchs from the Ordovician-Silurian boundary of the Prague Basin (Barrandian Area, Czechoslovakia). Abstracts. C.I.M.P. Acritarch and Chitinozoa Subcommissions. Symposium on Acritarchs and Chitinozoa, British Geological Survey, Keyworth, Nottingham, U.K., 3-6 September 1991.
DUFKA, P., & FATKA, O., 1993. Chitinozoans and acritarchs from the Ordovician-Silurian boundary of the Prague Basin (Czech Republic). *Special Papers in Palaeontology*, 48: 17-28.
DUNHAM, K., 1973. A recent deep borehole near Eyam, Derbyshire. *Nature Physical Science*, 241: 84-85.

E

EDWARDS, D., RICHARDSON, J.B., & THOMAS, R.G., 1978. Locality B9 Heol Senni Quarry, Powys. *In*: FRIEND, P.F. & WILLIAMS, B.P.J. (Eds.). Devonian of Scotland, the Welsh borderland and South Wales. International Symposium on the Devonian system. Field guide. The Palaeontological Association: 77-78.
EISENACK, A., 1930. Neue Mikrofossilien des baltischen Silurs (Vorläufige Mitteilung). *Die Naturwissenschaften*, 18: 180-181.
EISENACK, A., 1931. Neue Mikrofossilien des baltischen Silurs. I. *Paläontologische Zeitschrift*, 13: 74-118.
EISENACK, A., 1932. Neue Mikrofossilien des baltischen Silurs. II. (Foraminiferen, Hydrozoen, Chitinozoen u.a.). *Paläontologische Zeitschrift*, 14: 257-277.
EISENACK, A., 1934. Neue Mikrofossilien des baltischen Silurs. III. und Neue Mikrofossilien des böhmischen Silurs. I. *Paläontologische Zeitschrift*, 16: 52-76.
EISENACK, A., 1937. Neue Mikrofossilien des baltischen Silurs. IV. *Paläontologische Zeitschrift*, 19: 227-243.
EISENACK, A., 1938. Hystrichosphaerideen und verwandte Formen im baltischen Silur. *Zeitschrift für Geschiebeforschung und Flachlandsgeologie*, 14: 1-30.
EISENACK, A., 1939. Chitinozoen und Hystrichosphaerideen im Ordovizium des Rheinischen Schiefergebirges. *Senckenbergiana lethaia*, 21: 135-152.
EISENACK, A., 1944. Über einige pflanzliche Funde in Geschieben, nebst Bemerkungen zum Hystrichosphaerideen-Problem. *Zeitschrift für Geschiebeforschung und Flachlandgeologie*, 19: 103-124.
EISENACK, A., 1948. Mikrofossilien aus Kieselknollen des böhmischen Ordoviziums. *Senckenbergiana lethaea*, 28: 105-117.
EISENACK, A., 1951. Über Hystrichosphaeridieen und andere Kleinformen aus baltischem Silur und Kambrium. *Senckenbergiana lethaea*, 32: 187-204.
EISENACK, A., 1953. Die Bestimmung des Alters von Kieselschiefer-Geröllen mittels Mikrofossilien. *Senckenbergiana lethaea*, 34: 99-103.
EISENACK, A., 1955. Chitinozoen, Hystrichosphären und andere Mikrofossilien aus dem Beyrichia-Kalk. *Senckenbergiana lethaea*, 36: 157-188.

EISENACK, A., 1958a. Mikrofossilien aus dem Ordovizium des Baltikums. 1. Markasitschicht, *Dictyonema*-Schiefer, Glaukonitsand, Glaukonitkalk. *Senckenbergiana lethaia*, 39: 389-405.

EISENACK, A., 1958b. *Tasmanites* Newton 1875 und *Leisphaeridia* n.g. als Gattungen der Hystrichosphaeridea. *Palaeontographica Abteilung A*, 110: 1-19.

EISENACK, A., 1959. Neotypen baltischer Silur-Hystrichosphären und neue Arten. *Palaeontographica Abteilung A*, 112: 193-211.

EISENACK, A., 1961. Hystrichosphaeren als Nahrung ordovizischer Foraminiferen. *Neues Jahrbuch für Geologie und Paläontologie. Monatshefte*, 1961-1: 15-19.

EISENACK, A., 1962a. Einige Bemerkungen zu neueren Arbeiten über Hystrichosphären. *Neues Jahrbuch für Geologie und Paläontologie. Monatshefte*, 1962-2: 92-101.

EISENACK, A., 1962b. Mikrofossilien aus dem Ordovizium des Baltikums. 2) Vaginatenkalk bis Lyckholmer Stufe. *Senckenbergiana lethaea*, 43: 349-366.

EISENACK, A., 1962c. Mitteilungen über Leiosphären und über das Pylom bei Hystrichosphären. *Neues Jahrbuch für Geologie und Paläontologie. Abhandlungen*, 114: 58-80.

EISENACK, A., 1963a. Über einige Arten der Gattung *Tasmanites* Newton 1875. *Grana Palynologica*, 4: 203-216.

EISENACK, A., 1963b. Mitteilungen zur Biologie der Hystrichosphären und über neue Arten. *Neues Jahrbuch für Geologie und Paläontologie. Abhandlungen*, 118: 207-216.

EISENACK, A., 1963c. Sind die Hystrichosphären Zysten von Dinoflagellaten? *Neues Jahrbuch für Geologie und Paläontologie. Monatshefte*, 1963-5: 225-231.

EISENACK, A., 1963d. Hystrichosphären. *Biological Review*, 38: 107-139.

EISENACK, A., 1964. Zur Frage rezenter Hystrichosphären. *Neues Jahrbuch für Geologie und Paläontologie. Monatshefte*, 1964-2: 108-113.

EISENACK, A., 1965. Die Mikrofauna der Ostseekalke 1. Chitinozoen, Hystrichosphären. *Neues Jahrbuch für Geologie und Paläontologie. Abhandlungen*, 123: 115-148.

EISENACK, A., 1967. *Axisphaeridium* n. g., eine axialsymmetrische Hystrichosphäre aus dem baltischen Ordovizium. *Neues Jahrbuch für Geologie und Paläontologie. Monatshefte*, 1967-7: 398-400.

EISENACK, A., 1968a. Mikrofossilien eines Geschiebes der Borkholmer Stufe, baltisches Ordovizium, F2. *Mitteilungen des Geologischen Staatsinstituts Hamburg*, 37: 81-94.

EISENACK, A., 1968b. Über die Fortpflanzung paläozoischer Hystrichosphären. *Neues Jahrbuch für Geologie und Paläontologie. Abhandlungen*, 131: 1-22.

EISENACK, A., 1969. Zur Systematik einiger paläozoischer Hystrichosphären (Acritarcha) des baltischen Gebietes. *Neues Jahrbuch für Geologie und Paläontologie. Abhandlungen*, 133: 245-266.

EISENACK, A., 1970. Mikrofossilien aus dem Silur Estlands und der Insel Ösel. *Geologiska Föreningen i Stockholm Förhanlingar*, 92: 302-322.

EISENACK, A., 1971. Die Mikrofauna der Ostseekalke (Ordovizium). 3. Graptolithen, Melanoskleriten, Spongien, Radiolarien, Problematika nebst 2 Nachträgen über Foraminiferen und Phytoplankton. *Neues Jahrbuch für Geologie und Paläontologie. Abhandlungen*, 137: 337-357.

EISENACK, A., 1972. Chitinozoen und andere Mikrofossilien aus der Bohrung Leba, Pommern. *Palaeontographica, Abteilung A*, 139, 64-87.

EISENACK, A., 1974. Beiträge zur Acritarchen-Forschung. *Neues Jahrbuch für Geologie und Paläontologie. Abhandlungen*, 147: 269-293.

EISENACK, A., 1976. Mikrofossilien aus dem Vaginatenkalk von Hälluden, Öland. *Palaeontographica*. Abteilung A, 154: 181-203.

EISENACK, A., CRAMER, F. H. & DIEZ, M., 1973. Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien Band III Acritarcha 1. Teil. Stuttgart, Schweitzerbart'sche Verlagsbuchhandlung: 1-1103.

EISENACK, A., CRAMER, F. H. & DIEZ, M., 1976. Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien Band IV Acritarcha 2. Teil. Stuttgart, Schweitzerbart'sche Verlagsbuchhandlung: 1-863.

EISENACK, A., CRAMER, F. H. & DIEZ, M., 1979a. Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien Band V Acritarcha 3. Teil. Stuttgart, Schweitzerbart'sche Verlagsbuchhandlung: 1-533.

EISENACK, A., Cramer, F. H. and Diez, M., 1979b. Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien Band VI Acritarcha 3. Teil. Stuttgart, Scheitzerbart'sche Verlagsbuchhandlung: 1-532.

EISERHARDT, K. H., 1984. *Carinatosphaeridium* n.g. (Acritarcha) aus einem Öjlemyr-Flintgeschiebe Gotlands (ob. Ordoviz.). *Neues Jahrbuch für Geologie und Paläontologie. Monatshefte*, 1984-9: 521-528.

EISERHARDT, K. H., 1985. *Orthosphaeridium rectangulare* (Eisenack 1963) (Acritarcha) aus einem

Öjlemyrflint-Geschiebe (Schweden). *Mitteilungen des Geologisch-Paläontologischen Instituts der Universität Hamburg*, 59: 137-154.

EISERHARDT, K. H., 1986. *Palaeohystrichosphaeridium wimani* (Eisenack 1968) n.g. - ein ordovizischer Dinoflagellat? *Neues Jahrbuch für Geologie und Paläontologie. Monatshefte*, 1986-3: 175-191.

EISERHARDT, K. H., 1987. Das Acritarch *Goniosphaeridium polygonale* supsp. *robustum* n.ssp. aus Öjlemyrflint-Geschiebe. *Mitteilungen der Gesellschaft für Geschiebekunde*, 3: 31-33.

EISERHARDT, K. H., 1989a. Acritarchs from a Rogö-Sandstone-Geschiebe (Lower Ordovician). *Archiv für Geschiebekunde*, 1: 31-48.

EISERHARDT, K.H. 1989b. Baltisphären aus Gotländer Öjlemyrflint (Acritarchs, Oberordoviz, Geschiebe, Schweden). *Mitteilungen des Geologisch-Paläontologischen Instituts der Universität Hamburg*, 68: 79-129.

EISERHARDT, K.H., 1991a. Die Acritarcha des Öjlemyrflintes. Monographie des oberordovizischen Palynoplanktons der balto-skandischen Provinz aus Öjlemyrflintgeschieben. Unpublished Ph.D. thesis. Universität Hamburg, Germany.

EISERHARDT, K.H. 1991b. Sphaeromorphe Zysten und Phycomata aus Öjlemyrflint-Geschieben (Oberordoviz, Gotland/Schweden) Teil 1. *Neues Jahrbuch für Geologie und Paläontologie. Monatshefte*, 1991-7: 381-407.

EISERHARDT, K.H. 1991c. Sphaeromorphe Zysten und Phycomata aus Öjlemyrflint-Geschieben (Oberordoviz, Gotland/Schweden) Teil 2. *Neues Jahrbuch für Geologie und Paläontologie. Monatshefte*, 1991-10: 579-596.

EISERHARDT, K.H. 1992. Die Acritarcha des Öjlemyrflintes. *Palaeontographica Abteilung B*, 226, 1-132.

EISERHARDT, K.H. & SERVAIS, T., 1993. Acritarcheaous microphytoplankton from the subsurface of Rügen (North Germany). Abstracts. 63. Jahrestagung der Deutschen Paläontologischen Gesellschaft. 21-26 September 1993, Prag: 9.

EISERHARDT, K.H. & SERVAIS, T., 1994. Eine Tremadoc/Arenig zeitliche Acritarchen-Vergesellschaftung aus der Bohrung Rügen 5 (NO-Deutschland). Abstracts. 64. Jahrestagung der Deutschen Paläontologischen Gesellschaft. September 1994, Budapest.

ELAOUAD-DEBBAJ, Z., 1981. Acritarches de l'Ordovicien supérieur du synclinal de Buçaco (Portugal). *Bulletin de la Société géologique et minéralogique de Bretagne*, C, 10: 1-101.

ELAOUAD-DEBBAJ, Z., 1984. Acritarches et chininozoaires de l'Arénig-Llanvirn de l'Anti-Atlas (Maroc). *Review of Palaeobotany and Palynolology*, 43: 67-88.

ELAOUAD-DEBBAJ, Z., 1987. Acritarches et Chitinozoaires de l'Ordovicien du Maroc - Systématique, Biostratigraphie, Corrélations. Unpublished thesis (Thèse d'Etat), Université de Rennes, France: 1-126.

ELAOUAD-DEBBAJ, Z., 1988a. Acritarches et chitinozoaires du Trémadoc de l'Anti-Atlas (Morocco). *Revue de Micropaléontologie*, 31: 85-128.

ELAOUAD-DEBBAJ, Z., 1988b. Acritarches de l'Ordovicien supérieur (Caradoc-Ashgill) de l'Anti-Atlas, Maroc. *Revue de Micropaléontologie*, 30: 232-248.

ELAOUAD-DEBBAJ, Z. & HENRY, J. L., 1980. Structure de la paroi de *Aremoricanium rigaudae*. Geobios, 13: 627-632.

EMO, G. T. & SMITH, D. G., 1978. Palynological evidence for the age of the Lower Palaeozoic rocks of Slieve Aughty, Counties Clare and Galway. *Proceedings of the Royal Irish Academy*, 19: 281-292.

ERDTMANN, B.D., 1994. Toward a new stratigraphy for the Tremadoc of the East European Platform - despite many "stumbling blocks" enroute to interregional correlations. Wogogob-Meeting 1994. Bornholm, Denmark, 29.08.-04.09.1994, Abstracts: 13-15.

ERKMEN, U., 1979. Stratigraphical distribution of the Lower Palaezoic acritarchs from southeast Turkey: comparisons with other Mediterranean countries. GEOCOME I, First Geological Congress of the Middle East, September 4-7, 1979, Ankara: 472-495.

ESTRADA, S., HEUSE, T. & SCHULZ, E., 1994. Zur regionalgeologischen Interpretation kambro-ordovizischer Schichten an der Nordwest-Flanke des Schwarzburger Antiklinoriums, Thüringen. *Zeitschrift geologischer Wissenschaften*, 22: 537-553.

EVITT, W. R., 1963a. A dicussion and proposals concerning fossil dinoflagelattes, hystrichospheres, and acritarchs. I. *Proceedings of the National Academy of Sciences*, 49: 158-164.

EVITT, W. R., 1963b. A dicussion and proposals concerning fossil dinoflagelattes, hystrichospheres, and acritarchs. II. *Proceedings of the National Academy of Sciences*, 49: 298-302.

F

FANG XIAOSI, 1986a. Ordovician Micropalaeoflora in Kunming Liquan Region, Yunnan Province and its stratigraphical signifiance. *Professional Paper of Stratigraphy and Palaeontology. Geology Publishing House*, 16: 125-175.

FANG XIAOSI, 1986b. New Lower Ordovician Microplant Genera and Species in Ercun, Kunming, Yunnan Province. *Bulletin of the Institute of Geology. Chinese Academy of Geological Sciences*, 14: 155-158.

FATKA, O., 1991a. Chitinozoans and acritarchs in early Arenig sediments of the Prague Basin (Barrandian area, Czechoslovakia). Abstracts. C.I.M.P. Acritarch and Chitinozoa Subcommissions. Symposium on Acritarchs and Chitinozoa, British Geological Survey, Keyworth, Nottingham, U.K., 3-6 September 1991.

FATKA, O., 1991b. Mikropaleontologicky vyzkum na hranici kralodvor-kosov (Micropalaeontological research of the Kralodvor-Kosor boundary beds). *Zpravy o geologickych vyzkumech v roce* 1989: 58-59.

FATKA, O., 1992a. Early Arenig acritarchs from the lower Klabava Formation (Prague Basin, Czechoslovakia).*Vestnik Ceskeho geologickeho ustavu*, 67: 277-288.

FATKA, O., 1992b. Mikropaleontologicky vyzkum spodniho ordoviku (Micropalaeontological research of the Lower Ordovician. *Zpravy o geologickych vyzkumech v roce* 1990: 47-48.

FATKA, O., 1993. Chitinozoans and acritarchs in latest Tremadoc-early Arenig sediments of the Prague Basin, Czech Republic. *Special Papers in Palaeontology*, 48: 29-36.

FATKA, O. & BROCKE, R., 1993. Populations of *Arbusculidium filamentosum* (Vavrdova 1965) Vavrdova 1972 from Arenig (early Ordovician) of the Klabava Formation (Bohemia) and the Dawan Formation (China). Abstracts. 63. Jahrestagung der Deutschen Paläontologischen Gesellschaft. 21-26 September 1993, Prag: 61.

FATKA, O., KRAFT, J. & KRAFT, P., 1994. Paleontological-stratigraphical relations on the Arenig/Llanvirn boundary in the Prague Basin (Ordovician, Bohemia). 2nd International Meeting du projet IGCP n° 351 "Early Paleozoic Evolution in NW Gondwana". Rabat, 29 nov. - 7 dec. 1994. Abstracts: 35-36.

FENSOME, R.A., WILLIAMS, G.L., BARSS, M.S., FREEMAN, J.M. & HILL, J.M. 1990. Acritarchs and fossil prasinophytes: an index to genera, species and intraspecific taxa. *A.A.S.P. Contribution Series*, 25: 1-771.

FENSOME, R.A., WILLIAMS, G.L., BARSS, M.S., FREEMAN, J.M. & HILL, J.M. 1991. Alphabetic listing of acritarch and fossil prasinophyte species. *A.A.S.P. Contribution Series*, 26: 1-111.

FENTON, J. P. G., 1976. Palynological evidence for the age of the Dula Formation (Ordovician) in Anglesey (North Wales). *Journal of the University of Sheffield, Geological Society*, 7: 1-5.

FIELDING, A., 1992. Acritarch microfloral changes across the Ordovician-Silurian boundary. Abstracts 8th International Palynological Congress, Aix-en-Provence, 45.

FOMBELLA, M.A., 1978. Acritarcos de la Formacion Oville, edad Cambrico medio - Tremadoc. *Palinologia*, numero extraordinario 1: 245-262.

FOMBELLA, M. A., 1979a. Palinologia de la Formacion Oville al Norte y Sur de la Cordillera Cantabrica, Espana. *Palinologia*, 1: 1-16.

FOMBELLA-BLANCO, M., 1979b. Palinologia de la Formacion Oville, en las Provincias de Leon y de Oviedo, Edad Cambrico Medio Inferior, Cambrico Superior-Tremadoc. Unpublished Ph.D. thesis, Universidad de Oviedo, Spain.

FOMBELLA-BLANCO, M. A., 1982. Determinacion palinologica del Tremadoc en la localidad de Verdiago, Provincia de Leon, NO de Espana. *Revista Espanola de Micropaleontologia*, 14: 13-22.

FOMBELLA-BLANCO, M. A., 1984. Age palynologique du Blastomilonitic grabben, zone occidentale de la Galice. *Revue de Micropaléontogie*, 27: 113-117.

FOMBELLA-BLANCO, M. A., 1986. El transito Cambrico-Ordovico, palinologia y diacronismo, provincia del Leon, NO de Espana. *Revista Espanola de Micropaleontologia*, 13: 165-179.

FOMBELLA-BLANCO, M.A., VALENCIA-BARRERA, R.M., FERNANDEZ-GONZALEZ, D. & HERRERO-VILLACORTA, B., 1992. The palynological variability of Oville Formation in the Cantabrian mountains (Spain). Abstracts 8th International Palynological Congress, Aix-en-Provence, 46.

FOMBELLA SANTOS, M.A. & CACHAN SANTOS, L.J., 1992. Diferencias en la Composicion Palinologica de la Formacion Oville, NO de Espana. Conferencia Internacional Paleozoico Inferior de Ibero-América, Mérida, 8-12 Mayo de 1992. Libro de Resumenes. Publicaciones del Museo de Geologia de Extremadura n°1: 72.

FORTEY, R.A., BASSETT, M.G., HARPER, D.A.T., HUGHES, R.A., INGHAM, J.K., MOLYNEUX, S.G., OWEN, A.W., OWENS, R.M., RUSHTON, A.W.A. & SHELDON, P.R., 1991. Progress and problems in the selection of stratotypes for the bases of series in the Ordovician System of the historical type area in the U.K. *In*: BARNES, C.R. & WILLIAMS, S.H. (eds.), Advances in Ordovician Geology, Geological Survey of Canada, Paper 90-9: 5-25.

FOURNIER-VINAS, C., 1978. Acritarches Cambro-Ordovicien des Monts de Lacaune (Nord de la Montagne Noire, France). *Palinologia*, numéro

extraordinario 1: 263-271.
FOURNIER-VINAS, C., 1985. Acritarches ordoviciens des Zekkara (Maroc oriental). *Geobios*, 18: 807-813.
FOURNIER-VINAS, C. & DONNOT, M., 1977. Présence d'acritarches dans l'Ordovicien inférieur et le Cambrien des monts de l'est de Lacaune (Aveyron). Versant nord de la Montagne noire. *Bulletin du B.R.G.M.*, 2.1.2: 121-129.
FU JIAYUAN, 1986. The Ordovician group of micropalaeoflora from Xiliangsi and Jiancoaofou Formations of Zhenha, Shaanxi. *Bulletin of the Xian Institut of Geology and Mineral Resource, Chinese Academy of Geological Sciences*, 12: 113-128.

G

GAO LIANDA, 1991. Acritarchs from the Lower Ordovician Hongshiyan Formation of Wuding, Yunnan. *Geological Review*, 37: 445-455.
GAMARRA, S.L. & LEGAULT, J.A., 1991. Acritarchs of the Ordovician Simcoe Group, Southern Ontario. *Palynology*, 15: 242.
GARDINER, P. R. R. & VANGUESTAINE, M., 1971. Cambrian and Ordovician microfossils from SE Ireland and their implications. *Bulletin of the Geological Survey of Ireland*, 1: 163-210.
GHAVIDEL-SYOOKI, M., 1990. The encountered acritarchs and chitinozoans from Mila, Ilebek and Zard Kuh Formation in Tang-e-Ilebek at Zard Kuh and their Correlation with the Palaeozoic sequence at Chal-i-Sheh area. Proceedings of Symposium on diapirism with special reference to Iran. Teheran University, 8th-14th December 1990. Islamic Republic of Iran, Bandarabbas, Vol. 1: 148-218.
GHAVIDEL-SYOOKI, M., 1992. First Ordovician palynological record from the Alborz-mountain range; Northern Iran. Abstracts 8th International Palynological Congress, Aix-en-Provence: 52.
GHAVIDEL-SYOOKI, M., 1993. Palynological study of Paleozoic sediments of the Chal-i-Sheh Area, Southwestern Iran. *Journal of Sciences. Islamic Republic of Iran*: 32-46.
GORBATSCHEV, R., FROMM, E. & KJELLSTRÖM, G. 1976. Beskrivning till berggrundskartan, Linköping N.O. *Sveriges Geologiska Undersökning*, 107: 1-111.
GORKA, H., 1967. Quelques nouveaux Acritarches des silexites du Trémadocien supérieur de la région de Kielce (Montagne de Ste Croix - Pologne). *Archives originales du Centre de Documentation du C.N.R.S.*, 441: 1-8.
GORKA, H., 1969. Microorganismes de l'Ordovicien de Pologne. *Palaeontologia Polonica*, 22: 1-102.
GORKA, H., 1979. Les acritarches de l'Ordovicien moyen d'Olsztyn IG 2 (Pologne). *Acta Palaeontologica Polonica*, 24: 351-376.
GORKA, H., 1980. Le microplancton de l'Ordovicien moyen de Strabla (Pologne). *Acta Palaeontologica Polonica*, 25: 261-277.
GORKA, H., 1987. Acritarches et prasinophyceae de l'Ordovicien moyen (Viruen) du Sondage de Smedsby Gard no. 1 (Gotland, Suède). *Review of Palaeobotany and Palynology*, 52: 257-297.
GRAHAM, J. R. & SMITH, D. G., 1980. The age and signifiance of a small lower Paleozoic inlier in County Mayo, Tipperary. *Journal of Earth Sciences of the Royal Dublin Society*, 4: 1-5.
GUY-OHLSON, D. & LINDQVIST, B. 1990. Palynomorph content of the uraniferous Alum shales of Cambrian-Ordovician age in Sweden. *Ore Geology Reviews*, 5: 525-536.

H

HAFENRICHTER, M., 1980. The lower and upper boundary of the Ordovician System of some selected regions (Celtiberia, Eastern Sierra Morena) in Spain. Part II: The Ordovician/Silurian boundary in Spain. *Neuses Jahrbuch für Geologie und Paläontologie. Abhandlungen*, 160: 138-148.
HAMMANN, W., HEUNISCH, C. & SCHÜSSLER, U., 1989. Organische Microfossilien (Chlorophyta, Acritarcha, Sporae dispersae, Scolecodonten) aus den Schichten des Streichengrundes, Unterdevon, im Raum Guttenberg-Kupferberg des Frankenwaldes. *Beringeria*, 1: 57-113.
HAVLICEK, V. & FATKA, O., 1992. Ordovician of the Prague Basin (Barrandian area, Czechoslovakia). *In*: WEBBY, B.D. & LAURIE, J.R. (eds.), Global Perspectives on Ordovician Geology, Balkema: 461-472.
HAVLICEK, V., VANEK, J. & FATKA, O., 1994. Perunica microcontinent in the Ordovician (its position within the Mediterranean Province, series division, benthic and pelagic associations). *Sbornik geologickych ved. Geologie*, 46: 23-56.
HEDLUND, R. W., 1960. Microfossils of the Sylvan Shale (Ordovician) of Oklahoma. *University of Oklahoma abstr.*, 184. I-VI: 1-90.
HEINSALU, H., VIIRA, V. & PAALITS, I., 1991. Cambrian-Ordovician boundary beds in the Saka II Section, NE Estonia. *Proceedings of the Estonian Academy of Sciences*, 40: 5-15.
HENRY, J.L., 1964a. Sur la conservation d'un rassemblement d'Acritarches (microrganismes incertae sedis) sous forme de colonie, dans l'Ordovicien de Finistère. *Comptes Rendus de l'Académie des*

Sciences de Paris, 258: 1001-1003.

HENRY, J.L., 1964b. Sur la présence d'inclusions sphériques (Acritarches ?) chez un chitinozoaire ordovicien de Bretagne. *Comptes Rendus sommaires de la Société géologique de France*, 64: 150-151.

HENRY, J.L., 1966. Quelques Acritarches (micro-organismes incertae sedis) de l'Ordovicien de Bretagne. *Comptes Rendus sommaires de la Société géologique de France*, 66: 265-267.

HENRY, J.L., 1969. Micro-organismes incertae sedis (acritarches et chitinozoaires) de l'Ordovicien de la presqu'île de Crozon (Finistère): gisements de Mort-Anglaise et de Kerglintin. *Bulletin de la Société géologique et minéralogique de Bretagne*, 69: 59-100.

HENRY, J.L. & THADEU, D., 1971. Intérêt stratigraphique et paléogéographique d'un microplancton à Acritarches découvert dans l'Ordovicien de la Serra de Buçaco (Portugal). *Comptes Rendus de l' Académie des Sciences de Paris*, 272: 1343-1346.

HERBOSCH, A., VANGUESTAINE, M., DEGARDIN, J.M., DEJONGHE, L., FAGEL, N. & SERVAIS, T., 1991. Etude lithostratigraphique, biostratigraphique et sédimentologique du sondage de Lessines (bord méridional du Massif du Brabant, Belgique). *Annales de la Société Géologique de la Belgique*, 114: 195-212.

HE SHENG-CE & YIN LEI-MING, 1993. Late Ordovician acritarchs from Changwu Formation of Jiangshan, Zheijiang, China. *Acta Palaeontologica Sinica*, 32: 611-633.

HEUSE, T., 1989. Acritarchen aus dem Griffelschiefer (Ordovizium) des Schwarzburger Antiklinoriums. *Veröffentlichungen des Naturhistorischen Museums Schleusingen*, 4: 69-77.

HEUSE, T., 1990. Acritarchen-Biostratigraphie des Jungproterozoikums und Altpaläozoikums im Saxothuringikum. Unpublished Ph. D. thesis, Bergakademie Freiberg, Germany: 1-74.

HEUSE, T., 1994. Upper Ordovician acritarchs from the Frankenberger Zwischengebirge (Saxony), Eastern Germany. *Neues Jahrbuch für Geologie und Paläontologie. Abhandlungen*, 191: 357-391.

HEUSE, T., ERDTMANN, B.D. & KRAFT, P., 1994. Early Ordovician microfossils (acritarchs, chitinozoans) and graptolites from the Schwarzburg Anticline, Thuringia (Germany). *Veröffentlichungen des Naturhistorischen Museums Schleusingen*, 9: 41-68.

HILL, P. J. & MOLYNEUX, S. G., 1988. Biostratigraphy, palynofacies and provincialism of Late Ordovician-Early Silurian acritarchs from northeast Libya. *In*: EL-ARNAUTI, A., OWENS, B. & THUSU, B. (eds.), Subsurface Palynostratigraphy from Northeast Libya Benghazi, Garyounis University Publications: 27-44.

HU YUNGXU, 1986. Micropalaeoflora from the Early Ordovician in Gaoqiao Region of Shaanxi and its stratigraphic significance. *Bulletin of the Xian Institut of Geology and Mineral Resource, Chinese Academy of Geological Sciences*, 14: 199-239.

J

JACOBSON, S., 1977a. Biostratigraphy and paleoecology of acritarchs from Middle and Upper Ordovician rocks in the Cincinnati region. *Geological Society of America. Abstracts with Program*, 9: 609-610.

JACOBSON, S., 1977b. Acritarchs from Middle and Upper Ordovician rocks of the Eastern Midcontinent, U.S.A. Biostratigraphy and Paleoecology. Abstracts. Third International Symposium on the Ordovician System, Columbus: 27.

JACOBSON, S. R., 1978a. Acritarchs from the upper Ordovician Clays Ferry Formation, Kentucky, U.S.A. *Palinologia*, numéro extraordinario, 1: 293-301.

JACOBSON, S. R., 1978b. Acritarchs from Middle and Upper Ordovician rocks in New York State and the Cincinnati region in Ohio and Kentucky. Unpublished Ph.D. thesis, Ohio State University, 1-303.

JACOBSON, S. R., 1979. Acritarchs as paleoenvironmental indicators in middle and upper Ordovician rocks from Kentucky, Ohio and New York. *Journal of Paleontology*, 53: 1197-1212.

JACOBSON, S. R., 1987. "Middle Ordovician" acritarchs are guide fossils for the Upper Ordovician. *Lethaia*, 20: 91-92.

JACOBSON, S. R. & ACHAB, A., 1984. Acritarch palynostratigraphy of the *Dicellograptus complanatus* Zone (Ashgill) from the Upper Ordovician, lower Vaureal Formation, Anticosti Island, Quebec. Abstracts. 6th International Palynological Conference, Calgary: 72.

JACOBSON, S. R. & ACHAB, A., 1985. Acritarch biostratigraphy of the *Dicellograptus complanatus* graptolite zone from the Vaureal Formation (Ashgillian), Anticosti Island, Quebec, Canada. *Palynology*, 9: 165-198.

JAGIELSKA, L., 1962a. Preliminary note on microspores from the Ordovician of Brzeziny and Zbrza in the Swiety Krzyz mts. *Biuletyn Instytutu Geologicznego*, 174: 61-64.

JAGIELSKA, L., 1962b. Mikrospory starszego paleozoiku z otworu Uszkowce 1. *Kwartalnik Geologiczny*, 3: 330-344.

JANKAUSKAS, T., 1976. Révision de l'âge des formations "cambro-ordoviciennes" des régions baltiques par l'analyse micropaléontologique (acritarches, chitinozoaires). *Comptes Rendus sommaires de la Société géologique de France*, 76: 47-49.

JARDINE, S., COMBAZ, A., MAGLOIRE, L., PENIGUEL, G. & VACHEY, G., 1974. Distribution stratigraphique des acritarches dans le Paléozoique du Sahara Algérien. *Review of Palaeobotany and Palynology*, 18: 99-129.

JOHANSSON, H. G., KARIS, L. & KJELLSTRÖM, G., 1972. Notes on a new locality at Ljungsbro in the Lower Ordovician of Östergötland, Southern Sweden. *Geologiska Förningens i Stockholm Förhandlingar*, 94: 578-580.

JUX, U., 1971. Über den Feinbau der Wandungen einiger paläozoischer Baltisphaeridiaceen. *Palaeontographica Abteilung B*, 136: 83-147.

K

KALVACHEVA, R., 1969. Acritarchs from the Tseretsel Formation (Ordovician). *Review of the Bulgarian Geological Society*, 30: 88-90.

KALVACHEVA, R., 1972. Preliminary results from palynological studies of the lower Palaeozoic in the Iskur Gorge. *Review of the Bulgarian Geological Society*, 32: 242-251.

KALVACHEVA, R., 1974. Palynomorphen aus den Phyllitoiden T. des Stadza-Gebirges. *Comptes rendus de l'Académie bulgare des Sciences*, 27: 1419-1422.

KALVACHEVA, R., 1978. Acritarch stratigraphy of lower Paleozoic formations in the West Balkan Mountains. *Palinologia*, numéro extraordinario, 1: 303-311.

KALVACHEVA, R., 1979. Palynological evidence (acritarcha) for the age of the lower Palaeozoic rocks in the Vakarel Hill, Bulgaria. *Comptes rendus de l'Académie bulgare des Sciences*, 32: 1397-1400.

KALVACHEVA, R., 1980a. Upper Arenigian to lower Llanvirnian acritarchs from West Sredna Gora Mountain, Bulgaria. Abstracts, 5th International Palynological Congress, Cambridge: 196.

KALVACHEVA, R., 1980b. Ordovician acritarchs from the Western Balkan Mountains. Proceedings 11th Congress Carpatho-Balkan Geol. Assoc., Stratigraphy, "Naukova dumka", Kiev, 53-71.

KALVACHEVA, R., 1982a. Palynological evidence for the early-Ordovician (Arenigian) age of Ophiolites in the Botevgrad district (West Balkan Mountain) Bulgaria. *Comptes rendus de l'Académie bulgare des Sciences*, 35: 1101-1104.

KALVACHEVA, R., 1982b. Palynology and Stratigraphy of the Diabase-Phyllitoid Complex in the West Balkan Mountains. *Review of the Bulgarian Geological Society*, 43: 8-24.

KALVACHEVA, R., 1982c. Paleopalynology. *Priroda*, 31: 6-11.

KALVACHEVA, R., 1982d. Planktonic organizms - the age indicators. Microorganizms 475 million years old from the rocks of Botevgrad Balkan Mountains. *Bulgarian Telegraph Agency, "Nauka i Tehnika"*, 34: 6-9.

KALVACHEVA, R., 1984a. The Ordovician in Western Balkanids: palynological proofs. Bulgarian Geological Society, Scientific Conference, April 1984. Abstracts: 8-10.

KALVACHEVA, R., 1984b. Acritarch evidence for the Ordovician System in west Bulgaria. International Geological Congress Moscow, abstracts: 72-73.

KALVACHEVA, R., 1986a. Acritarch stratigraphy of the Ordovician system in Bulgaria. IGCP project n° 5: Correlation of Prevariscan and Variscan Events in the Alpine Mediterranean Mountain Belts. Final Meeting, Sardinia, abstracts: 38-43.

KALVACHEVA, R., 1986b. The oldest and the smallest fossils in Bulgaria and the Alps. *Newsletter "Hemus", Bulgarian Geological Society*, 21.

KALVACHEVA, R., 1988a. Early Palaeozoic acritarch datings in the basements of the Eastern part of the Alpine Belt (Bulgaria and North-East Italy). Abstracts International Symposium on Circum-Mediterranean Palynology (CIMP) Zeist, The Netherlands, April 19-23.

KALVACHEVA, R., 1988b. The Arenig acritarch assemblages from West Bulgaria - first proof of the presence of Arenig Series in the Balkan Peninsula. Abstracts, 5th International Symposium on the Ordovician System, St. Johns, Newfoundland: 45.

KALVACHEVA, R.K., 1990. Review of microfossil datings (Early Paleozoic acritarchs and Devonian ossicles) of low-grade metamorphic rocks. *In*: NIKOLOV, T.G. (ed.). Microfossils in Bulgarian stratigraphy. Bulgarian Geological Survey: 13-22.

KALVACHEVA, R.K., 1992. Acritarch datings and their use in pre-Silurian stratigraphic sequence in Hercynian basement of the West Bulgarian Alpine Structure. Conferencia Internacional Paleozoico Inferior de Ibero-America, Libro de Resumenes, Publicaciones del Museo de Geologia de Extremadura n° 1: 86.

KALVACHEVA, R.K. & CATALOV, G.A., 1974. Palynomorphen aus den Phillitoiden Tonschiefern des Strandza-Gebirges. *Comptes rendus de l'Académie bulgare des Sciences*, 27: 1419-1422.

KALVACHEVA, R. & CHOBANOVA, A., 1973. Statistical analysis on several species of the genus

Veryhachium (acritarcha) from the Ordovician in the Iskur Gorge (Bulgaria). *Bulletin of the Geological Institute - series paleontology*, 22: 5-20.

KALVACHEVA, R. & CHOBANOVA, A., 1974. Biometrics of *Veryhachium minutum* Downie,1958 (Acritarcha) from the Ordovician in the Iskur Gorge, Bulgaria. *Review of Palaeobotany and Palynology*, 18: 177-186.

KALVACHEVA, R. & DIMITROVA, N., 1973. Occurence of acritarchs in the Lower Palaeozoic in the Iskur Gorge, Bulgaria. *In*: "Microfossils of the oldest deposits". Proc. III International Palynological Conference, "Nauka", Moscow: 32-35.

KALVACHEVA, R., SASSI, F.P. & ZANFERRARI, A., 1986. Acritarch evidence for the Cambrian age of phyllites in the Agordo area (South-Alpine basement of Eastern Alps, Italy). *Review of Palaeobotany and Palynology*, 48: 311-326.

KALVACHEVA, R. & VITANOVA, N., 1977. Correlation du groupe diabase-phyllitoïde du Balcan occidental (Bulgarie) et du Paléozoique inférieur de Plateforme Moézienne (Roumanie). *Comptes rendus de l'Académie bulgare des Sciences*, 30: 1157-1160.

KEEGAN, J. B., RASUL, S. M. & SHAHEEN, Y., 1988. Palynostratigraphy of the Lower Palaeozoic, Cambrian to Silurian, sediments of the Hashemite Kingdom of Jordan. Abstracts International Symposium on Circum-Mediterranean Palynology (CIMP) Zeist, The Netherlands, April: 19-23.

KEEGAN, J. B., RASUL, S. M. & SHAHEEN, Y., 1990. Palynostratigraphy of the Lower Palaeozoic, Cambrian to Silurian, sediments of the Hashemite Kingdom of Jordan. *Review of Palaeobotany and Palynology*, 66: 167-180.

KJELLSTRÖM, G., 1968. Remarks on the chemistry and ultrastructure of the cell wall of some Palaeozoic leiospheres. *Geologiska Förningens i Stockholm Förhandlingar*, 90: 221-228.

KJELLSTRÖM, G., 1971a. Ordovician microplankton (Baltisphaerids) from the Grötlingbo borehole no.1 in Gotland, Sweden. *Sveriges geologiska undersökning*, 65: 1-75.

KJELLSTRÖM, G., 1971b. Middle Ordovician microplankton from the Grötlingbo borehole no.1 in Gotland, Sweden. *Sveriges geologiska undersökning*, 65: 1-35.

KJELLSTRÖM, G., 1972a. *Baltisphaeridium perpaucispinum* nom. nov. pro *Baltisphaeridium paucispinum* Kjellström, 1971, non (Deunff) Downie & Sarjeant, 1964. *Geologiska Förningens i Stockholm Förhanlingar*, 94: 111.

KJELLSTRÖM, G., 1972b. Lower Viruan microplankton from a boring in Öland, Sweden. *Neues Jahrbuch für Geologie und Paläontologie, Monatshefte*, 1972-12: 713-719.

KJELLSTRÖM, G., 1974. *Baltisphaeridium multiechinatum* nom.nov. pro *Baltisphaeridium echinatum* Kjellström, 1971. *Geologiska Föreningens i Stockholm Förhandlingar*, 96: 211-212.

KJELLSTRÖM, G., 1976. Lower Viruan (Middle Ordovician) microplankton from the Ekön Borehole n°1 in Östergötland, Sweden. *Sveriges geologiska undersökning*, 724: 1-44.

KONZALOVA-MAZANCOVA, M., 1969. Acritarcha Evitt 1963 aus dem Unter-Ashgill Böhmens. *Palaeontographica Abteilung B*, 125: 81-92.

KRÄUSEL, R., 1939. Sind die paläozoischen Hystrichosphaerideen Einzeller oder Pflanzensporen? *Senckenbergiana*, 21: 358-363.

L

LAKOVA, I., 1992. Upper Ordovician to Llandovery land plant spores and acritarchs from Dervent Heights, SE-Bulgaria. *Geologica Balcanica*, 22-1: 88.

LAKOVA, I., GOCEV, P.M., & YANEV, S., 1992. Palynostratigraphy and geological setting of the Lower Paleozoic allochthon of the Dervent Heigths, SE-Bulgaria. *Geologica Balcanica*, 22-6: 71-88.

LE CORRE, C. & DEUNFF, J., 1969. Sur la présence d'acritarches au sommet des schistes de l'Ordovicien moyen du Sud de Rennes. *Bulletin de la Société géologique et minéralogique de Bretagne*, C, 1: 45-48.

LEFORT, J. P. & DEUNFF, J., 1974. Etude du socle antémésozoïque de la partie septentrionale du golfe normano-breton. *Bulletin du B.R.G.M. section IV*, 2: 73-83.

LE FORT, M., TONGIORGI, M. & GAETANI, M., 1994. Discovery of a cristalline basement and early Ordovician marine transgression in the Karakorum Mountain Range, Pakistan. *Geology*, 22: 941-944.

LEGAULT, J. A., 1982. First report of Ordovician (Caradoc-Ashgill) palynomorphs from Orphan Knoll, Labrador Sea. *Canadian Journal of Earth Sciences*, 19: 1851-1856.

LE HERISSE, A., 1984. Upper Ordovician - Lower Silurian organic walled microphytoplankton from the Nar Borehole, Gotland, Sweden. Abstracts, 6th International Palynological Conference, Calgary.

LE HERISSE, A., 1988. Acritarches et kystes d'algues prasinophycées de l'Ordovicien supérieur et du Silurien de Gotland, Suède. Systématique - Biostratigraphie - Corrélations. Unpublished 'Docteur ès-Sciences de la Terre' thesis. Université de Bretagne Occidentale, Brest, France: 1-430.

LEWIS, A. P., 1940. The microfossils of the Upper Caradoc phosphate deposits of Montgomeryshire

(North Wales). *The Annals and Magazine of Natural History*, 5: 1-39.
LI JUN, 1987. Ordovician acritarchs from the Meitan Formation of Guizhou province, South-West China. *Palaeontology*, 30: 613-634.
LI JUN, 1989. Early Ordovician Mediterranean province acritarchs from Upper Yangtze Region, China. *In*: Developments in Geoscience; Contribution to the 28th Geological Congress 1989, Washington, D.C., U.S.A. Chinese Academy of Sciences, Beijing, 231-234.
LI JUN, 1990a. Ordovician acritarchs from the Jiuxi Formation of Jishou, Hunan. *Acta Micropalaeontologica Sinica*, 7: 141-160.
LI JUN, 1990b. The discovery of Early Ordovician acritarchs from Western Hunan. *Hunan Geology*, 9: 8-12.
LI JUN, 1991. The Early Ordovician acritarchs from SW-China. Unpublished Ph.D. thesis, Nanjing Institute for Geology and Palaeontology, Nanjing, Peoples Republic of China.
LINNEMANN, U., KURZE, M. & SEHNERT, M., 1988. Nachweis von altpaläozoischen Acritarchen und einige neue Ergebnisse lithostratigraphischer Untersuchungen im Elbtalschiefergebirge. *Veröffentlichungen des Museums der Westlausitz, Kamenz*, 12: 44-51.
LISTER, T. R., 1970. The method of opening, orientation and morphology of the Tremadocian acritarch *Acanthodiacrodium ubui* Martin. *Proceedings of the Yorkshire Geological Society*, 38: 47-55.
LISTER, T. R., BURGESS, I. C. & WADGE, A. J., 1969. Microfossils from the cleaved Skiddaw slates of Murton Pike and Brownber (Cross Fell Inlier). *Geological Magazine*, 106: 97-99.
LISTER, T. R., COCKS, L. R. M. & RUSHTON, A. W. A., 1969. The basement beds in the Bobbing borehole, Kent. *Geological Magazine*, 106: 601-603.
LISTER, T. R. & HOLLIDAY, D. W., 1970. Phytoplankton (acritarchs) from a small Ordovician inlier in Teesdale (County Durham), England. *Proceedings of the Yorkshire Geological Society*, 37: 449-460.
LI ZAIPING, 1982. Acritarchs from the upper Mamchiakou Formation in North China and their geologic age. *Acta palaeontologica sinica*, 21: 715-732.
LOEBLICH, A. R., 1970a. *Dicommopalla*, a new acritarch genus from the Dillsboro Formation (Upper Ordovician) of Indiana, U.S.A. *Phycologia*, 9: 39-43.
LOEBLICH, A. R., 1970b. Morphology, Ultrastructure and Distribution of Paleozoic Acritarchs. *Proceedings of the North American Paleontological Convention*, 69 part G: 705-788.
LOEBLICH, A. R. & MAC ADAM, R. B., 1971. North American species of the Ordovician Acritarch Genus *Aremoricanium*. *Palaeontographica Abteilung B*, 135: 41-47.
LOEBLICH, A. R. & TAPPAN, H., 1969. Acritarch excystment and surface ultrastructure with descriptions of some Ordovician taxa. *Revista espanola de Micropaleontologica*, 1: 45-57.
LOEBLICH, A. R. & TAPPAN, H., 1971a. Two new *Orthosphaeridium* (Acritarcha) from the Middle and Upper Ordovician. *Transactions of the American Microscopical Society*, 90: 182-188.
LOEBLICH, A. R. & TAPPAN, H., 1971b. New observations of the ultrastructure of *Asketopalla*, an Ordovician acritarch. *Journal of Paleontology*, 45: 899-901.
LOEBLICH, A. R. & TAPPAN, H., 1976. Some new and revised organic-walled phytoplankton microfossil genera. *Journal of Paleontology*, 50: 301-308.
LOEBLICH, A. R. & TAPPAN, H., 1978. Some middle and late Ordovician microphytoplankton from Central North America. *Journal of Paleontology*, 52: 1233-1287.
LOPUKNIN, A. S., 1971. Phytoplanctons of Proterozoic and Paleozoic of Eurazia . *In*: Dispersional remnants of fossil plants of Kirghizia. Acad. Sc. Kirghiz S.S.R Inst. geol.: 80-90.
LOVELOCK, P.E.R., POTTER, T.L., WALSWORTH-BELL, E.B. & WIEMER, W.M., 1981. Ordovician rocks in the Oman Mountains: the Amdeh Formation. *Geologie en Mijnbouw*, 60: 487-495.
LU LICHANG, 1987. Acritarchs from the Dawan Formation (Arenigian) of Huanghuachang in Yichang, western Hubei. *Acta micropaleonologica sinica*, 4.1: 87-101.

M

MacLEAN, B., WILLIAMS, G.L., SANFORD, B.V., KLASSEN, R.A., BLAKENAY, C. & JENNINGS, A., 1986. A reconnaissance study of the bedrock and superficial geology of Hudson Strait N.W.T. *Geological Survey of Canada, paper* 86.1B: 617-635.
MÄDLER, K.A., 1967. Hystrichophyta and Acritarchs. *Review of Palaeobotany and Palynology*, 5: 285-290.
MAJESTE-MENJOULAS, C., BOUILLIN J.P., CYGAN, C. & FOURNIER-VINAS C., 1986. Les formations paléozoïques (Cambrien à Carbonifère) des Monts Péloritains (Sicile). Premières datations par Acritarches et Condodontes. *Comptes Rendus de l'Académie des Sciences de Paris*, 303: 1315-1320.

MALETZ, J. & SERVAIS, T., 1993. Acritarchs and graptolites from the Early Llanvirn (Ordovician) of the Herscheider Schichten (Rheinisches Schiefergebirge, Germany). *Neues Jahrbuch für Geologie und Paläontologie. Abhandlungen*, 190: 125-142.

MARHOUMI, M. R., RAUSCHER, R. & VANGUESTAINE, M., 1982. Les microfossiles (chitinozoaires et acritarches) des schistes du Tazekka au Maroc oriental. *Sciences Géologiques. Bulletin*, 35: 137-145.

MARTIN, F., 1966. Les acritarches de Sart-Bernard (Ordovicien belge). *Bulletin de la Société belge de Géologie*, 74: 423-444.

MARTIN, F., 1967. Les acritarches du parc de Neuville-sous-Huy (Silurien belge). *Bulletin de la Société belge de Géologie*, 75: 306-335.

MARTIN, F., 1968. Les acritarches de l'Ordovicien et du Silurien belges. Détermination et valeur stratigraphique. Unpublished Ph. D. thesis, Université libre de Bruxelles, Belgique, vol. I: 1-128, vol. II: 1-186.

MARTIN, F., 1969a. Les acritarches de l'Ordovicien et du Silurien belges. *Mémoires de l'Institut Royal des Sciences naturelles de Belgique*, 160: 1-175.

MARTIN, F., 1969b. Sur l'âge des schistes de la Bande calédonienne de Sambre-Meuse à Ombret. *Annales de la Société Géologique de la Belgique*, 92: 241-242.

MARTIN, F., 1969c. Chitinozoaires de l'Arénig supérieur-Llanvirn inférieur en Condroz (Belgique). *Revue de Micropaléontologie*, 12: 99-106.

MARTIN, F., 1969d. Ordovicien et Silurien belges; données nouvelles apportées par l'étude des Acritarches. *Bulletin de la Société belge de Géologie*, 77: 175-181.

MARTIN, F., 1973. Les acritarches de l'Ordovicien inférieur de la Montagne Noire (Hérault, France). *Bulletin de l'Institut Royal des Sciences naturelles de Belgique*, 48: 1-61.

MARTIN, F., 1974. Ordovicien supérieur et Silurien inférieur à Deerlijk (Belgique). *Mémoires de l'Institut Royal des Sciences naturelles de Belgique*, 174: 1-71.

MARTIN, F., 1977a. Acritarches du Cambro-Ordovicien du Massif du Brabant, Belgique. *Bulletin de l'Institut Royal des Sciences naturelles de Belgique*, 51: 1-33.

MARTIN, F., 1977b. Ordovician Chitinozoa and Acritarchs from the St. Lawrence Lowlands (Québec and southeastern Ontario), Canada. Abstracts. Third International Symposium on the Ordovician System, Columbus: 27-28.

MARTIN, F., 1978. Lower Paleozoic chitinozoa and acritarcha from Newfoundland. *Geological Survey of Canada, Paper*, 78-1B: 73-81.

MARTIN, F., 1980a. Quelques chitinozoaires et acritarches ordoviciens supérieurs de la Formation de White Head en Gaspésie, Québec. *Canadian Journal of Earth Sciences*, 17: 106-119.

MARTIN, F., 1980b. Middle and Upper Cambrian and Lower Ordovician acritarchs from Random Island, E Newfoundland. Abstracts, 5th International Palynological Congress Cambridge: 251.

MARTIN, F., 1982. Some aspects of Late Cambrian and Early Ordovician acritarchs. *In*: BASSETT, M. G. & DEAN, W. T. (eds.), The Cambrian-Ordovician boundary: sections, fossil distributions, and correlations. National Museum of Wales, Geological Series: 2 -40.

MARTIN, F., 1983. Chitinozoaires et acritarches ordoviciens de la plate-forme du Saint-Laurent (Québec et Sud-Est de l'Ontario). *Geological Survey of Canada, Bulletin*, 310: 1-59.

MARTIN, F., 1984. New Ordovician (Tremadoc) acritarch taxa from the middle member of the Survey Peak Formation at Wilcox Pass, Southern Canadian rocky Mountains, Alberta. *Current Research, Part A, Geological Survey of Canada, Paper*, 84-1A: 441-448.

MARTIN, F., 1988. Late Ordovician and Early Silurian Acritarchs. *Bulletin of the British Museum of Natural History (Geology)*, 43: 299-309.

MARTIN, F., 1992. Uppermost Cambrian and Lower Ordovician acritarchs and Lower Ordovician chitinozoans from Wilcock Pass, Alberta. *Geological Survey of Canada, Bulletin*, 420: 1-57.

MARTIN, F., 1993. Acritarchs : A Review. *Biological Review*, 68: 475-538.

MARTIN, F. & DEAN, W.T., 1981. Middle and Upper Cambrian and Lower Ordovician acritarchs from Random Island, eastern Newfoundland. *Geological Survey of Canada, Bulletin*, 343: 1-43.

MARTIN, F. & KJELLSTRÖM, G., 1973. Ultrastructural study of some Ordovician acritarchs from Gotland, Sweden. *Neues Jahrbuch für Geologie und Paläontologie, Monatshefte*, 1973-1: 44-54.

MARTIN, F., MICHOT, J., & VANGUESTAINE, M., 1970. Le flysch caradocien d'Ombret. *Annales de la Société Géologique de la Belgique*, 93: 337-362.

MARTIN, F. & RICKARDS, B., 1979. Acritarches, chitinozoaires et graptolithes ordoviciens et siluriens de la vallée de la Sennette (Massif du Brabant, Belgique). *Annales de la Société Géologique de la Belgique*, 102: 189-197.

MARTIN, F. & VANGUESTAINE, M., 1969. Données bibliographiques sur les Oomorphitae et Diacromorphitae. Comptes rendus C.I.M.P. Liège, 1969: 7-11 (unpublished).

MARTIN, F. & YIN LEIMING, 1988. Early

Ordovician Acritarchs from southern Jilin Province, North-East China. *Palaeontology*, 31: 109-127.

McCAFFREY, W.D., BARRON, H.F., MOLYNEUX, S.G. & KNELLER, B.C., 1992. Recycled acritarchs as provenance indicators: implications for Caledonian terrane reconstruction. *Geological Magazine*, 129: 457-464.

McCLURE, H. A., 1988. Chitinozoan and acritarch assemblages, stratigraphy and biogeography of the Early Paleozoic of Northwest Arabia. *Review of Palaeobotany and Palynology*, 56: 41-60.

McGREGOR, D. C. & CRAMER, F. H., 1971. Palynomorphs of the Ordovician Cat Head member, Lake Winnipeg, Manitoba. *Geological Survey Canada, Bulletin*, 202: 1-10.

McLEAN, D., 1990. Unusual Palynological Assemblages from the Greenmoor Rock (Westphalian A) of Sheffield: Implications for Provenance. Abstracts. C.I.M.P. International Symposium to celebrate 25 years of palynology in the North Sea Basin, British Geological Survey, Keyworth, Nottingham, U.K., April 1990.

McLEAN, D., 1991. Provenance of reworked palynomorphs from the Greenmoor Rock (Langsettian, Late Carboniferous), Sheffield, England. Abstracts of the 8th International Palynological Congress. Aix-en-Provence, 6-12 September 1992: 94.

MELENDI, D.L. & VOLKHEIMER, W, 1982a. Datos palinological del limite Ordovicico-Silurico de Talacasto, Provincia de San Juan. 1ra Parte. *Asociacion Geologica Argentina, Revista*, 37: 221-236.

MELENDI, D.L. & VOLKHEIMER, W., 1982b. Datos palinological del limite Ordovicico-Silurico de Talacasto, Provincia de San Juan. Parte II. *Asociacion Geologica Argentina, Revista*, 37: 157-161.

MENDELSON, C.V., 1993. Acritarchs and prasinophytes. *In*: LIPPS, J.H. (ed.), Fossil Prokaryotes and Protists. Blackwell: 77-104.

MENS, K., VIIRA, V., PAALITS, I. & PUURA, I., 1989. Cambrian-Ordovician boundary beds at Mäekalda, Tallinn, north Estonia. *Proceedings Estonian Academy of Sciences. Geology*, 38: 101-111.

METTE, W., 1987. Geologische und Biostratigraphische Untersuchungen im Altpaläozoikum westlich von Cala/Westliche Sierra Morena (Prov. Huelva, Spanien). Unpublished "Diplomarbeit" thesis, Georg-August-Universität Göttingen, Germany: 1-168.

METTE, W., 1989. Acritarchs from Lower Paleozoic rocks of the western Sierra Morena, SW-Spain and biostratigraphic results. *Geologica et Palaentologica*, 23: 1-19.

MICHNIAK, R., 1959. Notes on the petrography and micropalaeophytology in the oldest strata of the Holy Cross Mts. *Bulletin of the Polish Academy of Sciences*, 7: 457-462.

MICHNIAK, R. & OLKOWICZ-PAPROCKA, I., 1976. O odkryciu utworow starszego palaozoiku we wschodniej czesce synklinorium Kieleckoagowskiego. *Kwartalnik Geologiczny*, 20: 261-271.

MILLER, M.A., 1982. Morphologic variation and significance of acritarch excystment structures through the Ordovician, Silurian and Devonian. *Palynology*, 6: 286.

MILLER, M.A., 1988. An Early Palaeozoic "acritarch" with morphology comparable to the Hydrodictyacea. Abstracts, 7th International Palynological Congress, Brisbane: 112.

MILLER, M.A., 1991. *Paniculaferum missouriensis*, gen. et sp. nov., a new Upper Ordovician acritarch from Missouri, U.S.A. *Review of Palaeobotany and Palynology*, 70: 217-223.

MILLER, M.A. & WICANDER, R., 1982. Upper Ordovician (Lower Richmondian) acritarchs and chitinozoans from Southeastern Indiana, U.S.A. *Palynology*, 6: 286-287.

MILLER, M. A. & WILLIAMS, G. L., 1988a. *Velatasphaera hudsonii* gen. et sp. nov., an Ordovician Acritarch from Hudson Strait, North West territories, Canada. *Palynology*, 12: 121-127.

MILLER, M. A. & WILLIAMS, G. L., 1988b. The essential role of palynology for bedrock mapping in Hudson Strait, N.W.T. *Palynology*, 12: 244.

MILLWARD, D. & MOLYNEUX, S.G., 1992. Field and biostratigraphic evidence for an unconformity at the base of the Eycott Volcanic Group in the English Lake District. *Geological Magazine*, 129: 77-92.

MOLYNEUX, S. G., 1979. New evidence for the age of the Manx Group, Isle of Man. *In*: HARRIS, A.L., HOLLAND, C.H. & LEAKE, B.E. (eds). The Caledonides of the British Isles - reviewed. Geological Society, London, Special Publication, 8: 415-421.

MOLYNEUX, S. G., 1980. Cambrian and Ordovician acritarchs from the Manx Group of the Isle of Man. Abstracts, 5th International Palynological Congress, Cambridge: 264.

MOLYNEUX, S. G., 1981. The micropalaeontology and age of the Manx Group, Isle of Man. Unpublished Ph.D. thesis, University of Sheffield, U.K.

MOLYNEUX, S. G., 1982. The stratigraphical implications of Cambrian and Early Ordovician Acritarchs from the Manx Group of the Isle of Man. *Palynology*, 6: 287-288.

MOLYNEUX, S. G., 1983. Initial results of palynological studies on the Lower Paleozoic rocks of

the southern uplands of Scotland. *Palynology*, 7: 243-244.
MOLYNEUX, S. G., 1987. Appendix. Acritarchs and Chitinozoa from the Arenig Series of south-west Wales. *Bulletin of the British Museum of National History (Geology)*, 41: 309-364.
MOLYNEUX, S. G., 1988a. Micropalaeontological evidence for the age of the Borrowdale Volcanic Group. *Geological Magazine*, 125: 541-542.
MOLYNEUX, S. G., 1988b. Late Ordovician acritarchs from North-East Libya. *In*: EL-ARNAUTI, A., OWENS, B. & THUSU, B. (eds.), Subsurface Palynostratigraphy from Northeast Libya, Benghazi, Garyounis University Publications: 45-60.
MOLYNEUX, S.G., 1990. Advances and problems in Ordovician palynology of England and Wales. *Journal of the Geological Society, London*, 147: 615-618.
MOLYNEUX, S.G., 1991a. Acritarch biostratigraphy in the Skiddaw Group (Tremadoc-Llanvirn) of northern England. Abstracts. C.I.M.P. Acritarch and Chitinozoa Subcommissions. Symposium on Acritarchs and Chitinozoa, British Geological Survey, Keyworth, Nottingham, U.K., 3-6 September 1991.
MOLYNEUX, S.G., 1991b. The contribution of palaeontological data to an understanding of the Early Palaeozoic framework of Eastern England. *Annales de la Société Géologique de Belgique*, 114: 93-105.
MOLYNEUX, S.G. & DORNING, K. J., 1989. Acritarch dating of latest Tremadoc-earliest Arenig (Early Ordovician) sediments in the Carmarthen district, south Wales. *Geological Magazine*, 126: 707-714.
MOLYNEUX, S.G. & DORNING, K. J. (eds.), 1993. Contributions to acritarch and chitinozoan research. *Special Papers in Palaeontology*, 48: 1-139.
MOLYNEUX, S. G. & PARIS, F., 1985. Late Ordovician Palynomorphs. *Journal of Micropalaeontology*, 4: 11-26.
MOLYNEUX, S. G. & RUSHTON, A. W. A., 1984. Discovery of Tremadoc rocks in the Lake District. *Proceedings of the Yorkshire Geological Society*, 45: 123-127.
MOLYNEUX, S. G. & RUSHTON, A. W. A., 1988. The age of the Watch Hill Grits (Ordovician), English Lake District: structural and palaeogeographical implications. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 79: 43-69.
MOY, C.J., 1988. Additional information from the acritarch assemblage of the Bellefonte Dolomite Formation, central Pennsylvania. Abstracts 7th International Palynological Congress, Brisbane: 116.
MOY, C.J., 1992. Organic-walled microphytoplankton from the Middle Ordovician of Pennsylvania. Abstracts 8th International Palynological Congress, Aix-en-Provence: 104.
MUIR, M. D. & SARJEANT, W. A. S., 1971. Bibliographie commentée des Tasmanacées et de formes vivantes apparentées. *In*: JARDINE, S. (ed.), Microfossiles organiques du Paléozoique. 3. Acritarches. Editions du Centre National de la Recherche Scientifique: 51-117.
MÄNNIL, R. M., 1966. Istorija rarvitija Baltiskogo basseina v ordovike. *Akad. Nauk. Estonskoi SSR Inst. Geol.*: 5-200.

N

NAUD, G. & PITTAU DEMELIA, P., 1985. Première découverte d'acritarches du Cambrien moyen à sup. basal et du Trémadocien-Arénigien dans la basse vallée du Flumendova: mise en évidence d'un nouveau témoin de la Phase sarde en Sardaigne orientale. *In*: Gruppi di lavoro del C.N.R.: "Paleozoico" e "Evoluzione magmatica e metamorfica della crosta fanerozoica". Evoluzione stratigrafica, tettonica, metamorfica e magmatica del Paleozoico italiano. Siena, 13-14 dicembre 1985, Note brevi e riassunti: 39-41.
NAUMENKO, A.I. & GUTAK, Y.M., 1982. Correlation of Ordovician deposits in the Erinat and Ulagan Troughs. *Geologiya i Geogizika*, 23: 113-116.
NAUMOVA, S. N., 1946. The spores from Cambrian and Silurian deposits. Vest. Akad. Nauk SSSR. Ser. Geol.: 121-124.
NAUMOVA, S. N., 1950. Spores from the Lower Silurian (in Russian). Trudy, Vsesoj. Konf. po Spor. - pylz Analys. Izd. Mosc. Univ. Moscow: 165-190.
NAUTIYAL, A. C., 1966. Discovery of "hystrichophyta" (acritarchs) in the Cambro-Ordovician sequence of Southeast Newfoundland. Geological Association of Canada and Mineralogical Association of Canada Technical Program 1966 Ann. Meeting, Halifax, Nova Scotia: 33-34.
N0HR-HANSEN, H. & BUNDGAARD-KOPPELJUS, E., 1988. Ordovician spores with trilete rays from Washington Land, North Greenland. *Review of Palaeobotany and Palynology*, 56: 305-311.
NORRIS, G. & SARJEANT, W. A. S., 1965. A descriptive index of genera of fossil dinophyceae and acritarcha. *Paleontological Bulletin New Zealand Geological Survey*, 40: 1-70.
NYGREEN, P. W., 1970. An unusual palynological assemblage from the Ordovician of Oklahoma. *Oklahoma Geological Notes*, 30: 60.

O

OTTONE, E.G., TORRO, B.A. & WAISFELD, B.G.,

1992. Lower Ordovician palynomorphs from the Acoite Formation, Northwestern Argentina. *Palynology*, 16: 93-116.
OULEBSIR, L., 1992. Chitinozoaires et palynomorphes dans l'Ordovicien du Sahara algérien: biostratigrapie et approche des paléoenvironnements. Unpublished Ph.D. thesis, Université de Rennes, France: 1-212.
OULEBSIR, L., PARIS, F. & BERNARD, D., 1992. Assemblages de palynomorphes et fluctuations paléoenvironnementales dans les formations ordoviciennes du Sahara algérien. Abstracts 8th International Palynological Congress, Aix-en-Provence: 111.

P

PAALITS, I. & ERDTMANN, B.D., 1993a. The first record of Ordovician acritarchs from the Görlitz Synclinorium (Saxony). Abstracts. Annual Meeting Deutsche Paläontologische Gesellschaft. Praha. 21-26 September 1993: 18.
PAALITS, I. & ERDTMANN, B.D., 1993b. The acritarch biozonation in the Tremadoc-Hunneberg (?Arenig) boundary interval in selected sequences of the East European Platform (EEP). International Symposium Rügen-Bornholm, Gesellschaft für Geowissenschaften e.V. Berlin. 5-10. Oktober 1993: 34.
PADILHA DE QUADROS, L., 1986a. Occorencia de microfosseis (Acritarchae) Ordovicianos na sub-Bacia do Alto Amazonas, Brasil. *Boletin téc. Petrobràs*, 29: 181-191.
PADILHA DE QUADROS, L., 1986b. Occorencia de microfosseis (Acritarchae) Ordovicianos na sub-Bacia do Alto Amazonas, Brasil. Simposia Paleobot. y Palinologia del Neopaleozoico. IV Congr. Argentino Paleontol. y Bioestrat. Mendoza, Noviembre 23-27, 1986: 151-156.
PADILHA DE QUADROS, L., 1988. Zoneamento Bioestratigrafico do Paleozoico inferior e médio (Seçao Marinha) da Bacia do Solimoes. *Boletin de Geociencias da Petrobràs*, 2: 95-110.
PARIS, F., 1971. Etude géologique de la terminaison orientale de Menez-Belair (Synclinorium médian armoricain). Unpublished thesis (Thèse de 3ème cycle). Université de Rennes, France: 1-141.
PARIS, F. & DEUNFF, J., 1970. Le Paléoplancton llanvirnien de La Roche-au-Merle. *Bulletin de la Société géologique et minéralogique de Bretagne*, 1970, 1: 25-43.
PARIS, F. & LE HERISSE, A., 1992. Palaeozoic in Western Brittany (Outline of the Armorican geological history and geological itinerary in the Crozon Peninsula) - 8th International Palynological Congress, Aix-en-Provence, 13-16th sept. 1992 - Excursion A. *Cahiers de Micropaléontologie*, 7: 5-28.
PARSONS, M.G. & ANDERSON, M.M., 1991. The biostratigraphic potential of Middle Cambrian to Tremadocian acritarchs: Modification of existing zonal schemes based on material from Conception and Trinity Bays, Newfoundland, and St.John, New Brunswick. *Palynology*, 15: 250.
PASKEVICIENE, L., 1993a. Middle Ordovician acritarchs from Lithuania and Kaliningrad District. Abstracts. Second Baltic Stratigraphic Conference. Vilnius, 9-14 May 1993.
PASKEVICIENE, L., 1993b. Acritarchs from the Upper Ordovician of East Lithuania. Abstracts. Second Baltic Stratigraphic Conference. Vilnius, 9-14 May 1993.
PIMENTEL DE BELLIZZIA, N., BELLIZZIA, G.A. & ULLOA, C., 1992. Paleozoico Inferior: uno sintesis del Noroeste de América del Sur (Venezuela, Colombia y Ecuador). *In*: GUTIERREZ MARCO, J.C., SAAVEDRA, J. & RABANO (eds.), Paleozoico Inferior de Ibero-América. Universidad de Extremadura: 203-224.
PISKUN, L.V., 1974. *Veryhachium* iz ordovika i silura Brestskoy vpadiny. Akademiya Nauk SSSR, Leningrad: 15-20.
PISKUN, L.V., 1976. Novye vidy akritarkh iz ordovikskikh i siluriiskikh otlozhenii Bretskoi vpadiny. Akademiya Nauk BSSR: 100-108.
PISKUN, L.V., VOLKOVA, N.A. & PASKEVICIENE, L.T., 1994. East-European platform Ordovician acritarchs. *Palynology in stratigraphy*. Moscow, Nauka: 36-39.
PITTAU, P., 1985. Tremadocian (Early Ordovician) acritarchs of the Arburese Unit, Southwest Sardinia. *Bolletino della Società Paleontologica Italiana*, 23: 161-204.
PITTAU DEMELIA, P. & DEL RIO, M., 1982. Acritarchi e loro significato stratigrafico nelle successioni paleozoiche della Sardegna. *Guida alla geologia del paleozoico sardo*, 1982: 33-35.
PITTAU, P. & DEL RIO, M., 1983. Cambrian and Lower Ordovician Acritarchs from Sardinia (Italy). *Palynology*, 7: 246.
PLAYFORD, G. & MARTIN, F., 1984. Ordovician acritarchs from the Canning Basin, Western Australia. *Alcheringa*, 8: 187-223.
PLAYFORD, G. & WICANDER, R., 1988a. Acritarch palynology of Lower Ordovician strata, Georgina Basin, Queensland, Australia. Abstracts 7th International Palynological Congress, Brisbane: 129.
PLAYFORD, G. & WICANDER, R., 1988b. Acritarch palynoflora of the Coolibah Formation

(Lower Ordovician), Georgina Basin, Queensland. *Memoir of the Association of Australian Palaeontologists*, 5: 5-40.
PRASAD, B. & MAITHY, P.K., 1986. Record of *Saharidia* Combaz, a late Cambrian-Tremadocian index fossil from Krol-e-Beds of Mussoorie syncline, India. *Current Science*, 55: 906-909.

R

RAHMANI, K., 1978. Présence de Chitinozoaires, d'Acritarches et de Spores dans le Paléozoique de la Région de Rabat, Maroc. *Palinologia*, numéro extraordinario, 1: 375-386.
RAHMANI, K., 1979. Etude palynologique du Paléozoïque de la région de Rabat. Datation de l'Ordovicien. *Mines Géologie Energie*, 46: 93-95.
RAHMANI, K., 1983. Etude palynologique du Paléozoïque (Ordovicien, Silurien, Dévonien) de la Région de Rabat (Oued Bou-Regreg). *Notes et mémoires du Service Géologique du Maroc*, 324: 1-132.
RAHMANI-ANTARI, K., 1990. Etude palynologique et évaluation de l'indice d'altération thermique du Paléozoique du forage DOT 1 (bassin des Doukkala Centre-Ouest marocain). *Review of Palaeobotany and Palynology*, 66: 211-228.
RAHMANI-ANTARI, K., 1995. Etude palynologique (spores, chitinozoaires, acritarches) dans le Paléozoïque (Cambrien à Devonien) du Maroc occidental et méridional (Biostratigraphie, paléobiogéographie et charactérisation de la matière organique). Unpublished Ph.D. thesis, Université de Paris VI, vol. 1: 1-283, vol. 2: 1-128.
RASUL, S.M., 1971. A systematic and stratigraphic study of the Tremadoc acritarchs of Shropshire. Unpublished Ph.D. thesis, University of Sheffield, U.K.
RASUL, S.M., 1974. The Lower Palaeozoic acritarchs *Priscogalea* and *Cymatiogalea*. *Palaeontology*, 17: 41-63.
RASUL, S. M., 1976. New species of the genus *Vulcanisphaera* (Acritarcha) from the Tremadocian of England. *Micropaleontology*, 22: 479-484.
RASUL, S. M., 1977. *Palaiosphaeridium*, a new acritarch genus from the Tremadoc of England. *Mercian Geologist*, 6: 119-121.
RASUL, S. M., 1978. The zonation of acritarch species of potential statigraphic signifiance in the Tremadoc of Shineton Shales, Shropshire, England. *Palynology*, 2: 230.
RASUL, S. M., 1979. Acritarch zonation of the Tremadoc series of the Shineton Shales, Wrekin, Shropshire, England. *Palynology*, 3: 53-72.
RASUL, S. M. & DOWNIE, C., 1974. The stratigraphic distribution of Tremadoc acritarchs in the Shineton Shales succession, Shropshire, England. *Review of Palaeobotany and Palynology*, 18: 1-10.
RAUSCHER, R. 1970. Les Chitinozoaires de l'Ordovicien du synclinal de May-sur-Orne (Calvados). *Bulletin de la Société linnéenne de Normandie*, 101: 117-127.
RAUSCHER, R., 1971. Acritarches du Paléozoïque inférieur de la Montagne Noire. *Bulletin Service Carte géologique de l'Alsace-Lorraine*, 24: 291-196.
RAUSCHER, R., 1974a. Recherches micropaléontologiques et stratigraphiques dans l'Ordovicien et le Silurien de la France. *Mémoires de l'Université Louis Pasteur (Strasbourg), Sciences géologiques*, 38: 1-224.
RAUSCHER, R., 1974b. Les acritarches de l'Ordovicien en France. *Review of Palaeobotany and Palynology*, 18: 83-98.
RAUSCHER, R. & DOUBINGER, J., 1970. Les Chitinozoaires des schistes à calymènes (Llanvirnien) de Normandie. Comptes rendus du 29e Congrès National de la Société Savante de Strasbourg et Colmar, 1967: 471-484.
RAUSCHER, R., MARHOUMI, R., VANGUESTAINE, M. & HOEPFFNER, C., 1982. Datation palynologique des schistes du Tazekka au Maroc. Hypothèse structurale sur le socle hercynien de la Meseta orientale. *Comptes Rendus de l'Académie des Sciences de Paris*, 294 : 1203-1206.
REGNELL, G., 1955. *Leiosphaera* (Hystrichosph.) aus unterordovizischem Kalkstein in SO-Schonen, Schweden. *Geologiska Föreningens i Stockholm Förhanlingar*, 77: 546-575.
REITZ, E., 1991. Acritarchen des Unter-Tremadoc aus dem westlichen Frankenwald, NE-Bayern. *Neues Jahrbuch - für Geologie und Paläontologie, Monatshefte*, 1991-2: 97-104.
REITZ, E. & HEUSE, T., 1994. Palynofazies im Oberordovizium des Saxothuringikums. *Neues Jahrbuch für Geologie und Paläontologie. Monatshefte*, 1994-6: 348-360.
REITZ, E. & HÖLL, R., 1989. Unterordovizische Acritarchen aus der Nördlichen Grauwackenzone (Ostalpen). *Jahrbuch der Geologischen Bundesanstalt*, 132: 761-774.
REITZ, E. & HÖLL, R., 1990. Biostratigraphischer Nachweis von Unterordovizium in der Innsbrucker Quarzphillitserie (Ostalpen). *Jahrbuch der Geologischen Bundesanstalt*, 133: 603-610.
REITZ, E. & HÖLL, R., 1991. Biostratigraphischer Nachweis von Arenig in der Nördlichen Grauwackenzone (Ostalpen). *Jahrbuch der Geologischen Bundesanstalt*, 134: 329-344.

REITZ, E. & HÖLL, R., 1992. Palynological evidence for Lower Ordovician rocks (Tremadoc and Arenig) in the Northern Greywacke Zone (Eastern Alps). *Terra Nova*, 4: 198-207.

REITZ, E. & WICKERT, F., 1989. Late Cambrian to Early Ordovician acritarchs from the Villé Unit, Northern Vosges Mountains (France). *Neues Jahrbuch für Geologie und Paläontologie, Monatshefte*, 1989-6: 375-384.

RIBECAI, C., 1988. Biostratigrafia ad acritarchi nel Cambriano superiore e Tremadociano delle sezioni di Degerham e Furuhäll (Öland - regione Baltica). Unpublished thesis (Tesi di Laurea), Universita degli Studi di Pisa, Pisa, 1-125.

RIBECAI, C. & TONGIORGI, M., 1992. Arenigian acritarchs from Horns Udde (Oland, Sweden): a preliminary report. Abstracts, 8th International Palynological Congress, Aix-en-Provence: 122.

RIBECAI, C. & TONGIORGI, M., 1994. Acritarch correlations between some sections from northern Öland (Sweden). Wogogob-Meeting 1994. Bornholm, Denmark, 29.08.-04.09.1994, Abstracts: 32.

RICHARDSON, J. B. & RASUL, S. M., 1978a. Lower Devonian spores and reworked acritarchs from the Witney borehole, Southern England, and their geological implications. *Palynology*, 2: 231.

RICHARDSON, J. B. & RASUL, S. M., 1978b. Palynomorphs in Lower Devonian sediments from the Apley Barn Borehole, Southern England. *Pollen et Spores*, 20: 423-462.

RICHARDSON, J. B. & RASUL, S.M., 1978c. Palynological evidence for the age and provenance of the Lower Old Red Sandstone from the Apley Barn Borehole, Witney, Oxfordshire. *Proceedings of the Geological Association*, 90: 27-42.

RIGHI, E., 1991. *Ampullula*, a new acritarch genus from the Ordovician (Arenig-Llanvirn) of Öland. *Review of Palaeobotany and Palynology*, 68: 119-126.

ROCHE, M., SABIR, M., STEEMANS, P. & VANGUESTAINE, M., 1986. Palynologie du sondage et de la région de Willerzie. *Aardkundige Mededelingen*, 3: 149-190.

RUSHTON, A.W.A., 1985. A Lancefieldian graptolite from the Lake District. *Geological Magazine*, 122: 329-333.

RUSHTON, A. W. A. & MOLYNEUX, S. G., 1989. The biostratigraphic age of the Ordovician Skiddaw Group in the Black Combe Inlier, English Lake District. *Proceedings of the Yorkshire Geological Society*, 47: 267-276.

S

SARJEANT, W. A. S., 1966. Observations on the acritarch genus *Micrhystridium* (Deflandre). *Revue de Micropaléontologie*, 9: 201-208.

SARJEANT, W.A.S. & STANCLIFFE, R.P.W., 1991. Classification of the *Micrhystridium* and *Veryhachium* group of acritarchs: a modified approach. Abstracts. C.I.M.P. Acritarch and Chitinozoa Subcommissions. Symposium on Acritarchs and Chitinozoa, British Geological Survey, Keyworth, Nottingham, U.K., 3-6 September 1991.

SARJEANT, W.A.S. & STANCLIFFE, R.P.W., 1994. The *Micrhystridium* and *Veryhachium* complexes (Acritarcha : Acanthomorphitae and Polygonomorphitae): a taxonomic reconsideration. *Micropaleontology*, 40: 1-77.

SASSI, F. P., DEL MORRO, A., KALVACHEVA, R. & ZANFERRARI, A., 1984a. Chronological data and problems concerning the South Alpine Basement in the Eastern Alps. *IGCP n° 5 Newsletter*, 6: 111-115.

SASSI, F. P., KALVACHEVA, R. & ZANFERRARI, 1984b. New data on the age of deposition of the South-Alpine phyllitic basement. *Neues Jahrbuch für Geologie und Paläontologie, Monatshefte* 1984-1: 741-751.

SASSI, F. P., ZANFERRARI, A. & KALVACHEVA, R., 1984c. Acritarch dating of phyllites in the Agordo area (South-Alpine basement of the Eastern Alps, Italy). Proceedings of the 27th International Geological Congress Moscow: 172-173.

SCHOPF, J. M., 1969. Early Paleozoic palynomorphs. *In*: TSCHUDY, R.H. & SCOTT, A.C. (eds.), Aspects of palynology. Wiley: 163-192.

SCHOPF, J. M. & SCHOPF, T. J. M., 1962. Acid resistant microfossils from the Cynthiana Formation and Eden Group. *Geological Society of America*, abstracts for 1961: 264-265.

SEHNERT, M., 1991a. Beiträge zur Biostratigraphie epizonaler Metamorphite in der Wippraer Einheit (Harz). Unpublished Ph.D. thesis, Martin-Luther-Univerität Halle-Wittenberg, Germany.

SEHNERT, M., 1991b. Upper Ordovician and Silurian acritarchs in the Wippra Unit, Harz Mountains. C.I.M.P. Subcommissions Acritarch & Chitinozoa. Symposium on Acritarchs and Chitinozoa. Keyworth-Nottingham. U.K. 3-6 September 1991.

SELLBERG, B. & KJELLSTRÖM, G., 1975. Geometric characterization of acritarchs belonging to the genus *Veryhachium*. *Neues Jahrbuch für Geologie und Paläontologie, Monatshefte* 1975-5: 310-314.

SERGEEVA, L.A. & KALVACHEVA, R., 1983. Mikropaleofitologicheskiye issledovaniya metamorficheskikh orbrazonvaniy Karpato-Balkanskoy skladchatoy oblasti (Micropalaephytological research of metamorphic rocks in the Karpatho-Balkan area). *In*: PAPULOV, G.N. (ed.), Stratigrafiya i Korrelatsiya

Osadkov Metodami Palinologii : Materialy IV Vsesoyuznoi palinologicheskoi Konferntsii (Thymen, 1981). Akademiya Nauk SSSR, Uralskii Nachnyi Tsentr, Sverdlovsk: 53-56.

SERVAIS, T., 1991a. Contribution to the stratigraphy of the Ordovician Rigenée Formation (Brabant Massif, Belgium) with preliminary studies on Acritarchs. *Annales de la Société Géologique de Belgique*, 114: 233-245.

SERVAIS, T., 1991b. Bibliography and index of the Ordovician acritarchs. Abstracts. C.I.M.P. Acritarch and Chitinozoa Subcommissions. Symposium on Acritarchs and Chitinozoa, British Geological Survey, Keyworth, Nottingham, U.K., 3-6 September 1991.

SERVAIS, T., 1991c. The Ordovician acritarch genus *Frankea* Burmann 1970. Abstracts. C.I.M.P. Acritarch and Chitinozoa Subcommissions. Symposium on Acritarchs and Chitinozoa, British Geological Survey, Keyworth, Nottingham, U.K., 3-6 September 1991.

SERVAIS, T., 1992. A review of the Lower Palaeozoic acritarch genera *Coryphidium* VAVRDOVA, 1972 and *Vavrdovella* LOEBLICH & TAPPAN, 1976. Abstracts 8th International Palynological Congress, Aix-en-Provence: 135.

SERVAIS, T., 1993a. The Ordovician acritarch *Frankea*. *Special Papers in Palaeontology*, 48: 79-95.

SERVAIS, T., 1993b. A critical review of some Ordovician acritarch taxa and their stratigraphical implications in Belgium and Germany. Unpublished Ph.D. thesis, Université de Liège, Belgium: 1-380.

SERVAIS, T., 1994. The Ordovician acritarchs from Rügen (NE-Germany): palaeobiogeographical evidence for the attribution to Eastern Avalonia. *Neues Jahrbuch für Geologie und Paläontologie. Monatshefte* 1994-9: 566-580.

SERVAIS, T. & BROCKE, R., 1992. Ordovician acritarchs from boreholes of the Island of Rügen, NE-Germany. Abstracts 8th International Palynological Congress, Aix-en-Provence: 135.

SERVAIS, T., BROCKE, R., & FATKA, O., 1994. Biometrics of the *Dicrodiacrodium ancoriformenormale* group. Contributions to the CIMP Symposium on Palynology, Palaeoenvironments and Stratigraphy, 6-10 September 1994, University of Sheffield, England: 37.

SERVAIS, T., EISERHARDT, K.H., FATKA, O., & PAALITS, I., 1994. The Lower Palaeozoic 'galeate' acritarch plexus: a discussion. Contributions to the CIMP Symposium on Palynology, Palaeoenvironments and Stratigraphy, 6-10 September 1994, University of Sheffield, England: 38.

SERVAIS, T. & KATZUNG, G., 1993. Acritarch dating of Ordovician sediments of the Island of Rügen (NE-Germany). *Neues Jahrbuch für Geologie und Paläontologie, Monatshefte* 1993-12: 713-723.

SERVAIS,T. & MALETZ, J., 1992. Lower Llanvirn (Ordovician) graptolites and acritarchs from the 'assise de Huy', Bande de Sambre-et-Meuse, Belgium. *Annales de la Société Géologique de Belgique*, 115: 265-284.

SERVAIS, T., VANGUESTAINE, M. & HERBOSCH, A., 1993. Review of the stratigraphy of the Ordovician in the Brabant Massif, Belgium. *Geological Magazine*, 130: 699-710.

SHESGEGOVA, L. I., 1971. Akritarchi Paleozoia (Palaeozoic acritarchs). Izdatelstvo Nauka, Moskva: 9-35.

SHESGEGOVA, L. I., 1974. Akritarkhi Silura i nizov Devona Podolii (Silurian and Lower Devonian acritarchs). - Mikrofossilii SSSR, Akad. Nauk SSSR, Sibirskoe. *Trudy Inst. Geol. Geof.*, 81: 36-69.

SHESGEGOVA, L. I., 1975. Phytoplancton of the Silur from the Tuva (the section of the "Alegest"). *Transactions of Institute of Geology and Geophysics*, 224: 1-99.

SHESGEGOVA, L.I., 1978. Svravnitelnaya kharakteristika siluriiskikh kompleksov akritarkh i svyas ikh Usloviyami Osadkoobrazovaniya. *Akademiya Nauk SSSR, Sibirskoe Otdelenie, Trudy*, 508: 166-174.

SMITH, D. G., 1980. Progress in Irish Lower Palaeozoic Stratigraphic Palynology. Abstracts 5th International Palynological Congress, Cambridge: 366.

SMITH, D. G., 1981. Progress in Irish Lower Palaeozoic Palynology. *Review of Palaeobotany and Palynology*, 34: 137-148.

SOUFIANE, A. & ACHAB, A., 1993. Quelques assemblages de Chitinozoaires de l'Ordovicien du Maroc, bassin de Tadla. *Geobios*, 26: 535-553.

STANCLIFFE, R.P.W. & SARJEANT, W.A.S., 1994. The acritarch genus *Veryhachium* Deunff 1954, emend. Sarjeant and Stancliffe 1994: a taxonomic restudy and a reassessment of its constituent species. *Micropaleontology*, 40: 223-241.

STAPLIN, F. L., JANSONIUS, J. & POCOCK, S. A. J., 1966. Evaluation of some Acritarchous Hystrichosphere Genera. *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen*, 123: 167-201.

STEEMANS, P., 1989. Etude palynostratigraphique du Dévonien inférieur dans l'Ouest de l'Europe. *Mémoires pour servir à l'Explication des Cartes Géologiques et Minières de la Belgique*, 27: 1-453.

STEMPIEN, M., 1990. Ordovician and Silurian acritarchs of the Niestachow Sandstone Formation (Gory Swietokrzyskie Mountains). *Annales Societatis Geologorum Poloniae*, 60: 59-74.

STORCH, P., FATKA, O., & KRAFT, P., 1993. Lower Palaeozoic of the Barrandian area (Czech

Republic) - a review. Coloquios de Paleontologia, n° 45. Editorial Complutense, Madrid, 1993: 163-190.
STREEL, M. & BLESS, M.J.M., 1980. Occurrence and significance of reworked palynomorphs. *Mededelingen Rijks Geologische Dienst*, 32: 69-80.

T

TAPPAN, H., 1980. The Paleobiology of Plant Protists. Freeman & Co., San Francisco: 1-1027.
TAPPAN, H. & LOEBLICH, A. R., 1971. Surface sculpture of the wall in Lower Paleozoic acritarchs. *Micropaleontology*, 17: 385-410.
TAPPAN, H. & LOEBLICH, A. R., 1973. Evolution of the Oceanic Plankton. *Earth-Science Reviews*, 9: 207-240.
TAPPIN, D. R. & DOWNIE, C., 1978. New Tremadoc strata at outcrop in the Bristol Channel. *Journal of the Geological Society*, 135: 321.
TERS, M. & DEFLANDRE, G., 1966. Sur l'âge cambro-silurien des terrains anciens de la Vendée littorale (ex-Briovérien). *Comptes Rendus de l'Académie des Sciences de Paris*, 262: 339-342.
THERY, J.M., 1985. Nouvelles données de l'Ordovicien Colombien, implications régionales. Géodynamique des Caraïbes. Symposium, Paris, 5-8 Février 1985: 495-503.
THERY, J. M., PENIGUEL, T. & HAYE, G., 1986. Descubrimiento de Acritarcos del Arenigiano cerca a Araracuara (Caqueta-Colombia). Ensayo de Reinterpretacion de esta Region de la Saliente del Vaupes. *Geologia norandina*, 9: 1-20.
THOMAS, R.G., 1978. Locality B 16 Huscle Bridge Quarry, Neyland, S.W. Dyfed. *In*: FRIEND, P.F. & WILLIAMS, B.P.J. (eds.). Devonian of Scotland, the Welsh Borderland and South Wales, Int. Symp. on the Devonian system. Field guide. The palaeontological Association: 89-91.
TIMOFEEV, B. V., 1958a. Über das Alter sächsischer Grauwacken. *Geologie*, 7: 826-845.
TIMOFEEV, B. V., 1958b. Proterozoic spores and Lower Palaeozoic deposits of East Siberia and their stratigraphic signifiance (in Russian). Sob. Razrab. Start. Skhem. Sibiri 1956 Trudy Dokl. Strat. Dokemb. Otlozh. Moscow: 226-230.
TIMOFEEV, B. V., 1959. The ancient flora of the Baltic region and its stratigraphic significance. *Trudy VNIGRI*, 129: 1-320.
TIMOFEEV, B. V., 1962. Sur l'âge des couches sédimentaires-métamorphiques de l'Antartic oriental et de l'Australie méridionale (Donnés de l'analyse micropaléontologique). *In*: Abstr. Internat. Palyn. Conf. Tucson. Arizona 1962. *Pollen et Spores*, 4: 382-383.
TIMOFEEV, B. V., 1963a. Fitoplankon ordovika i silura Sibirskoy Platformy (Ordovician and Silurian phytoplancton of the Siberian Platform. *Dokl. Akad. Nauk SSSR*, 149: 45-48.
TIMOFEEV, B. V., 1963b. O fitoplanktone i dispernykh sporas ordovika silura i nizhnego devona pribaltiki, sventokshiskikh gor i Podola . *Dokl. Akad. Nauk SSSR*, 150: 26-29.
TIMOFEEV, B. V., 1966. Micropaleophytological study of the ancient series (in Russian). *Akad. Nauk. U.S.S.R.*: 1-147.
TIMOFEEV, B.V., GERMAN, T.N. & MIKHAILOVA, N.S., 1976. Mikrofitofossilii dokembrya, kembriya i ordovika (Precambrian, Cambrian and Ordovician microphytofossils). *Akademiy Nauk SSSR*: 1-106.
TONGIORGI, M., 1994a. Did Lower to Middle Ordovician acritarchs recognize the Tornquist Sea? Wogogob-Meeting 1994. Bornholm, Denmark, 29.08.-04.09.1994, Abstracts: 35.
TONGIORGI, M., 1994b. Remarks on *Peteinosphaeridium* and related genera. Contributions to the CIMP Symposium on Palynology, Palaeoenvironments and Stratigraphy, 6-10 September 1994, University of Sheffield, England: 42.
TONGIORGI, M., ALBANI, R. & DI MILIA, A., 1984. The Solanas Sandstones of Central Sardinia: new paleontological data (Acritarchs) and an attempt of geological interpretation (a "post-sardinian" molasse ?). *Bulletin de la Société géologique de France*, 26: 665-680.
TONGIORGI, M., BELLAGOTTI, E., DI MILIA, A. & TRASCIATTI, M., 1982a. Prima datazione zu basi paleontologiche (Acritarchi) della Formazione di Solanas (Tremadociano, Arenigiano) (Meana Sardo, Sardegna centrale). Guida alla Geologia del Paleozoico sardo, Guida Geologiche Regionali. Soc. Geol. It. 1982: 127-128.
TONGIORGI, M., BELLAGOTTI, E., DI MILIA, A. & TRASCIATTI, M., 1982b. Acritarchi dell'Ordoviciano inferiore nella formazione di Solanas della Zona di Meana Sardo (Sardegna Centrale). Paleontologia Stratigrafica ed Evoluzione. Quaderno n° 2, 1982.
TONGIORGI, M., DI MILIA, A., LE FORT, P. & GAETANI, M., 1994. Palynological dating (Arenig) of the sedimentary sequence overlying the Ishkarwaz Granite (upper Yarkhun valley, Chitral, Pakistan). *Terra Nova*, 6: 595-607.
TONGIORGI, M., DI MILIA, A., STOUGE, S. & BAGNOLI, G., 1988. Acritarchs from the Upper Cambrian - lower Tremadocian section of Degerham Road at Oeland, Sweden. Abstracts 8th International Palynological Congress, Brisbane: 164.

TONGIORGI, M. & RIBECAI, C., 1990. Late Cambrian and Tremadocian Phytoplankton (Acritarchs) communities from Öland (Sweden). *Bolletino della Società Paleontogia Italiana*, 29: 77-88.

TONGIORGI, M., YIN LEIMING & DI MILIA, A., 1992. Arenigian acritarchs from the Daping section (Yangtze gorges area, Hubei province, Southern China) and their palaeogeographic significance. Abstracts 8th International Palynological Congress, Aix-en-Provence: 147.

TOURNEUR, F., VANGUESTAINE, M., BUTTLER, C., MAMET, B., MOURAVIEFF, N., POTY, E., & PREAT, A., 1993. A preliminary study of Ashgill carbonate beds from the lower part of the Fosses Formation (Condroz, Belgium). *Geological Magazine*, 130: 673-679.

TRAVERSE, A., 1988. Paleopalynology. Unwin Hyman: 1-600.

TRYTHALL, R. J. B., ECCLES, C., MOLYNEUX, S. G. & TAYLOR, W. E. G., 1987. Age and control of ironstone deposition (Ordovician) North Wales. *Geological Journal*, 22: 31-43.

TSEGELNUYK, P.D., 1980. Stratigrafiya ordovika yugo zapadnoi okraoiny wostochno-Evropeiskoi platformy (Ordovician stratigraphy of the SW border of the East European Platform). *Tekonika i Stratigrafiya*, 19: 84-95.

TURNER, R.E., 1979. Acritarchs of Llandeilo and Caradoc age from classic localities in Britain. Unpublished Ph.D. thesis, University of Sheffield, U.K.

TURNER, R. E., 1980. Ordovician acritarchs from the type section of the Caradoc Series. *Palynology*, 4: 253.

TURNER, R. E., 1982. Reworked acritarchs from the type section of the Ordovician Caradoc Series, Shropshire. *Palaeontology*, 25: 119-143.

TURNER, R. E., 1984. Acritarchs from the type area of the Ordovician Caradoc Series, Shropshire, England. *Palaeontographica B*, 190: 87-157.

TURNER, R. E., 1985. Acritarchs from the type area of the Ordovician Llandeilo Series, South Wales. *Palynology*, 9: 211-234.

TURNER, R. E., TAYLOR, R. T., GOODE, A. J. J. & OWENS, B., 1980. Palynological evidence for the age of the Mylor Slates, Mount Wellington, Cornwall. *Proceedings Ussher Society*, 4: 274-283.

TURNER, R. E. & WADGE, A. J., 1979. Acritarch dating of Arenig Volcanism in the Lake District. *Proceedings of the Yorkshire Geological Society*, 42: 405-414.

TYNNI, R., 1975. Ordovician hystrichospheres and chitinozoans in limestone from the Bothnian Sea. *Bulletin Geological Survey of Finland*, 279: 1-59.

TYNNI, R., 1982. On Paleozoic microfossils in clastic dykes in the Aland Islands and in the core samples of Lumparn. *Bulletin Geological Survey of Finland*, 317: 35-114.

TYNNI, R. & UUTELA, A., 1988. Ordovician-Silurian acritarchs from Rapla borehole, Estonia, U.S.S.R. Abstracts 7th International Palynological Congress, Brisbane: 167.

U

UMNOVA, N.I., 1971. Silurian and Ordovician acritarch assemblages from the northern and western parts of the Russian Platform. *In*: Section IV. Paleophytic and Proterophytic Palynology. Tzeizy Dokladov na III Meshdunarodnoi Palinogicheskoi Konferentsii, Novosibirsk. Akademiya Nauk SSSR, Geologicheskii Institut, Moskva.

UMNOVA, N.I., 1974. Kompleksy akritarkh ordovika i silura severnoi i zapadnoi chastei Russkoi platformy (Ordovician and Silurian acritarch assemblages in the northern and western parts of the Russian Platform). *In*: Palinologiya, Proterofiat i paleofita. III Meshdunarodnaya Palinologicheskaya Konferentsiya, Novosibirsk, 1971, Nauka, Moskva: 33-38.

UMNOVA, N. I., 1975. Akritarkhi ordovika i silura moskovsko sineklizy i pribaltiki (Ordovician and Silurian acritarchs of the Moscow syneclise and Peribaltic). Izdaelskva Nedra, Moscow: 1-167.

UMNOVA, N. I. & VANDERFLIT, E. K., 1971. Acritarch assemblage from Cambrian and early Ordovician sediments of the western and northwestern Russian Craton. *In*: The palynology Research in the Byelorussia and other regions of the USSR. Science and Engineering, Minsk: 45-73.

UUTELA, A., 1989. Age and dispersal of sedimentary erratics on the coast of southwestern Finnland. *Bulletin Geological Survey of Finland*, 349: 1-100.

UUTELA, A. & TYNNI, R., 1991. Ordovician acritarchs from the Rapla borehole, Estonia. *Bulletin Geological Survey of Finland*, 353: 1-135.

UUTELA, A., 1993. Paleozoic Microfossils from the Lake Lappajarvi Impact Crater, Western Finland. Abstracts. Second Baltic Stratigraphic Conference. Vilnius, 9-14 May 1993.

V

VALDIMIRSKAYA, I.V., TIMOFEEV, B.V. & CHACHIA, N.G., 1956. New facts about the age of the "Basement Beds" west of the Southern Urals (in Russian). Akad. Nauk. S.S.S.R. Dokl., 3 (3): 667-669.

VANDERFLIT, E.K. & MIKHAILOVA, N.S., 1992.

A new genus of microfossils from Lower Ordovician-Upper Cambrian deposits of the northwestern and northern parts of the Russian platform. *Paleontologicheskij Zhurnal* 1992: 66-69.

VANGUESTAINE, M., 1973. Etude palynologique du Cambro-Ordovicien de Belgique et de l'Ardenne Française. Systématique et Biostratigraphie. Unpublished Ph.D. thesis, Université de l'Etat de Liège, Belgium.

VANGUESTAINE, M., 1974. Espèces zonales d'Acritarches du Cambro-Trémadocien de Belgique et de l'Ardenne française. *Review of Palaeobotany and Palynology*, 18: 63-82.

VANGUESTAINE, M., 1978. Données palynologiques nouvelles dans l'Ordovicien inférieur du bassin de la Senne, Massif du Brabant, Belgique. *Annales de la Société géologique de Belgique*, 100: 193-198.

VANGUESTAINE, M., 1979. Remaniements d'acritarches dans le Siegenien et l'Emsien (Dévonien inférieur) du Synclinorium de Dinant (Belgique). *Annales de la Société géologique de Belgique*, 101: 243-267.

VANGUESTAINE, M., 1986. Progrès récents de la stratigraphie par Acritarches du Cambro-Ordovicien d'Ardenne, d'Irlande, d'Angleterre, du Pays de Galles et de Terre-Neuve orientale. *Annales de la Société géologique du Nord (France)*, 105: 65-76.

VANGUESTAINE, M., 1991. Datation par acritarches des couches cambro-tremadociennes les plus profondes du sondage de Lessines (bord méridional du Massif du Brabant, Belgique). *Annales de la Société géologique de Belgique*, 114: 213-231.

VANGUESTAINE, M., 1992. Biostratigraphie par acritarches du Cambro-Trémadocien de Belgique et des régions limitrophes: synthèse et perspectives d'avenir. *Annales de la Société géologique de Belgique*, 115: 1-18.

VANGUESTAINE, M. & ARAMBURU, C., 1988. Cambrian and Ordovician acritarchs and chitinozoa from the Cantabrian Mountains, NW Spain, Preliminary results. Abstracts, International Symposium on Circum-Mediterranean, Zeist, The Netherlands, April 19-23, 1988.

VAVRDOVA, M., 1965. Ordovician acritarchs from Central Bohemia. *Vestnik Ustredniho ustavu geologickeho*, 40: 351-357.

VAVRDOVA, M., 1966. Paleozoic microplancton from Central Bohemia. *Casopsis pro Mineralogii a Geologii*, 11.4: 409-414.

VAVRDOVA, M., 1972. Acritarchs from Klabava shales. *Vestnik Ustredniho ustavu geologickeho*, 47: 79-86.

VAVRDOVA, M., 1973. New acritarchs from Bohemian Arenig (Ordovician). *Vestnik Ustredniho ustavu geologickeho*, 48: 285-289.

VAVRDOVA, M., 1974. Geographical differentiation of Ordovician acritarch assemblages in Europe. *Review of Palaeobotany and Palynology*, 18: 171-176.

VAVRDOVA, M., 1976. Excystment mechanism of Early Paleozoic acritarchs. *Casopsis pro mineralogii a geologii*, 21: 55-64.

VAVRDOVA, M., 1977. Acritarchs from the Sarka Formation (Llanvirnian). *Vestnik Ustredniho ustavu geologickeho*, 52: 109-118.

VAVRDOVA, M., 1978. Nehtromorphitae and some other acritarchs from the Bohemian Lower Ordovician. Paleontologicka Konference '77. Univerzita Karlova Praha: 61-74.

VAVRDOVA, M., 1982a. Phytoplankton communities of Cambrian and Ordovician age of Central Bohemia. *Vestnik Ustredniho ustavu geologickeho*, 57: 145-155.

VAVRDOVA, M., 1982b. Recycled acritarchs in the uppermost Ordovician of Bohemia. *Casopsis pro Mineralogii a Geologii*, 27: 337-345.

VAVRDOVA, M., 1984a. Some plant microfossils of possible terrestrial origin from the Ordovician of Central Bohemia. *Vestnik Ustrdniho ustavu geologickeho*, 59: 165-170.

VAVRDOVA, M., 1984b. Rostlinné mikrofosilie a vliv kontakni metamorfozy na stenu schranek akritarch. *Geologické prace*, 81: 47-49.

VAVRDOVA, M., 1986. New genera of acritarchs from the Bohemian Ordovician. *Casopsis pro mineralogii a geologii*, 31: 349-360.

VAVRDOVA, M., 1988. Further acritarchs and terrestrial plant remains from the Late Ordovician at Hlasna Treban (Czechoslovakia). *Casopsis pro mineralogii a geologii*, 33: 1-10.

VAVRDOVA, M., 1989. New acritarchs and miospores from the Late Ordovician of Hlasna Treban, Czechoslovakia.*Casopsis pro mineralogii a geologii*, 34: 403-420.

VAVRDOVA, M., 1990a. Early Ordovician acritarchs from the locality Myto near Rokycany (late Arenig, Czechoslovakia). *Casopsis pro mineralogii a geologii*, 35: 239-250.

VAVRDOVA, M., 1990b. Coenobial acritarchs and other palynomorphs from the Arenig/Llanvirn boundary, Prague basin. *Vestnik Ustredniho ustavu geologickeho*, 65: 237-242.

VAVRDOVA, M., 1990c. Some types of excystment in Early Ordovician acritarchs. *Palynos*, 13: 5.

VAVRDOVA, M., 1991. A succession of acritarch assemblages in late Arenigian sequences: an attempt at zonation. Abstracts. C.I.M.P. Acritarch and Chitinozoa Subcommissions. Symposium on Acritarchs and Chitinozoa, British Geological Survey,

Keyworth, Nottingham, U.K., 3-6 September 1991.
VAVRDOVA, M., 1993. Acritarchs assemblages in the Arenig Series of the Prague Basin, Czech Republic. *Special Papers in Palaeontology*, 48: 125-139.
VAVRDOVA, M. & UTTING, J., 1972. Lower Palaeozoic microfossils from the Luapula Beds of the Mansa Area. *Records of the Geological Survey of Zambia*, 12: 81-89.
VERICHEV, E.M., VOLKOVA, N.A., PISKUN, L.V, SIVERZEVA, I.A. & STANKOVSKII, A.F, 1990. Akritarchi ordovika severa Russkoi plity (Ordovician acritarchs of the North of the Russian Platform). *Akamemyia Nauk SSSR, Izvestiya, Seryia Geologicheskaya*, 7 : 152-155.
VISWANATHIAH, M.N., VENKATACHALAPATHY, & SHANKARA, M., 1984. Acritarchs and associated microplankton from the Katageri Formation of the Badami Group, South India. *Review of Palaeobotany and Palynology*, 41: 13-30
VOLKHEIMER, W., MELENDI, D.L. & ACENOLAZA, F.G., 1980. Una microflora Ordovicica de la formacion Mojototo, Provincia de Salta. *Asociacion Geologica Argentina, Revista*, 35: 401-416.
VOLKOVA, N. A., 1984. *Elenia*, a new genus of acritarchs from the Cambrian-Ordovician deposits of the Russian platform. *Journal of Micropalaeontology*, 3: 7-10.
VOLKOVA, N. A., 1988. New acritarch forms from the lower Tremadoc of Estonia (in Russian). Papers of the Soviet Palynologists to the 7th International Palynological Congress, Brisbane, Australia: 79-81.
VOLKOVA, N.A., 1989. Acritarchs of the Cambrian-Ordovician boundary beds of Northern Estonia. *Akademiya Nauk SSSR, Izvestiya, Seriya Geologicheskaya*, 7: 59-67.
VOLKOVA, N., 1993a. Tremadocian Acritarchs of Estonia. Second Baltic Stratigraphic Conference, Vilnius, 9-14 May 1993.
VOLKOVA, N., 1993b. Acritarchs from the Cambrian-Ordovician boundary beds (Boring Core M-56) of the Estonian near-clint area. *Proceedings of the Estonian Academy of Sciences*, 42: 15-22.
VOLKOVA, N., 1993c. Taxonomic composition of acritarch and climate in the early Tremadoc phytoplancton province of the Baltic. *Stratigraphy, Geological Correlations*, 1: 39-43.
VOLKOVA, N., 1993d. Taxonomic composition of acritarchs in the Cambrian and Ordovician boundary sequence of Estonia against the background of glacio-eustatic and climatic fluctuations. *Stratigraphy, Geological Correlations*, 1: 97-102.
VOLKOVA, N. A. & MENS, K., 1988. Distribution of acritarchs in the Cambrian-Ordovician boundary beds of the Suhkrumägi section (North Esthonia) (in Russian). *Proceedings of the Academy of Sciences of the Estonian SSR. Geology*, 37: 97-102.
VOLKOVA, N.A. & SIVERZEVA, I.A., 1991. New Tremadocian acritarchs from the North of the Russian Platform. *Paleontologicheski Zhurnal* 1991: 119-123.

W

WADGE, A. J., NUTT, M. J. C., LISTER, T. R. & SKEVINGTON, D., 1969. A probable *Didymograptus murchisoni* zone fauna from the Lake District. *Geological Magazine*, 106: 595-598.
WADGE, A. J., OWENS, B. & DOWNIE, C., 1967. Microfossils from the Skiddaw Group. *Geological Magazine*, 104: 506-507.
WELSCH, M., 1983. A newly discovered acritarch sequence from the Middle Cambrian to Tremadoc continental margin deposits of the Digermul Peninsula, Finnmark, Northern Norway. *Palynology*, 7: 254-255.
WELSCH, M., 1984a. Die stratigraphische Bedeutung einiger ausgewählter Acritarchen aus Sedimenten der Digermul-Gruppe (Mittelkambrium bis Tremadoc), Finnmark, Nordnorwegen. *Geologica et Palaeontologica*, 18: 5-7.
WELSCH, M., 1984b. Acritarker. *In*: ERDTMANN, B.D., HENNINGSMOEN, G., WELSCH, M. & WIDOLPH, M.L. Fossiler fra Digermulhalvoya. *Ottar Tidsskrift for nordnorsk natur og kultur*, 164: 26-30.
WELSCH, M., 1986. Die Acritarchen der höheren Digermulgruppe, Mittelkambrium bis Tremadoc, Ost-Finnmark, Nord-Norwegen. *Palaeontographica Abteilung* B, 201: 1-109.
WETZEL, W., 1967. Charakteristik des marinen Planktons im untersten Ordovizium. *Geschiebe-Sammler*, 2: 35-50.
WHELAN, G. M., 1988. Preliminary acritarch and chitinozoan distributions across the Ordovician-Silurian boundary stratotype at Dob's Linn, Scotland. *Bulletin British Museum Natural History (Geology)*, 43: 41-44.
WHELAN, G. M. & BURTON, C. J., 1988. Acritarchs and chitinozoans from the Ordovician-Silurian boundary stratotype sediments. *Lethaia*, 21: 38.
WICANDER, R., 1992. Upper Ordovician acritarchs and chitinozoans from the Stonington an Bills Creek Formation, Michigan, U.S.A. Abstracts 8th International Palynological Congress, Aix-en-Provence: 161.
WICANDER, R. & FOSTER, B., 1989. Selected Early Ordovician acritarchs from the Bardwire

Terrace, Canning Basin, Western Australia. *Palynology*, 13: 287.
WILLIAMS, D. B. & SARJEANT, W. A. S., 1967. Organic-walled microfossils as depth and shoreline indicators. *Marine Geology*, 5: 389-412.
WILLIAMS, G. L., SARJEANT, W. A. S. & KIDSON, E. J., 1973. A glossary of the terminology applied to Dinoflagellates Cysts and Acritarchs. *A.A.S.P. Contribution series*, 2: 1-221.
WILSON, L.R., 1964. Recycling, stratigraphic leakage, and faulty techniques in Palynology. *Grana Palynologia*, 5: 425-436.
WILSON, L.R., 1965. Palynological age determination of a rock section in Ti valley, Pittsbourg County, Oklahoma. *Oklahoma Geological Notes*, 25: 11-18.
WILSON, L. R. & HEDLUND, R. W., 1962. Acid-resistant microfossils of the Sylvan Shale (Ordovician) of Oklahoma. *Pollen et Spores*, 4: 388.
WILSON, L. R. & SKVARLA, J., 1967. Electron-microscope study of the wall structure of *Quisquilites* and *Tasmanites*. *Oklahoma Geological Notes*, 27: 54-63.
WOLF, R., 1980a. The lower and upper boundary of the Ordovician system of some selected regions (Celtiberia, Eastern Sierra Morena) in Spain. *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen* 160: 118-137.
WOLF, R., 1980b. Acritarchen aus dem Tremadoc Keltiberiens. *Courier Forschungsintitut Senckenberg*, 42: 64-72.
WOLF, R., 1980c. Lithology and acritarchs of the Lower Ordovician formations of Celtiberia (NE Spain) with stratigraphic and palaeoenvironmental implications. Unpublished Ph.D. thesis, Univerität Würzburg, Germany: 1- 236 .
WRAY, J. C., 1964. Paleozoic Palynomorphs from Libya. *Society Econ. Paleontol. Min.*, special publication, 11: 90-95.
WRIGHT, R. P. & MEYERS, W. C., 1981. Organic-walled Microplankton in the Subsurface Ordovician of Northeastern Kansas. *Kansas Geological Survey. Subsurface Geology Series*, 4: 1-53.

X

XING YUSHENG, 1980. Microplants and chitinozoans from the Lower Ordovician Dachengsi Formation of Emeishan, Sichun. Abstracts 5th International Palynological Congress, Cambridge: 438.

Y

YIN LEIMING, 1985. Acritarchs. *In*: CHEN , J., QIAN, Y., LIN, Y., ZHANG, J., WANG, Z., YIN, L. & ERDTMANN, B. D. (eds.). Study on Cambrian-Ordovician boundary strata and its biota in Dayangcha, Hunjiang, Jilin, China: 101-109.
YIN LEIMING, 1986. Aspects of Cambrian-Ordovician boundary in Dayangcha, China. Acritarchs. *In*: CHEN, J.Y. (ed.). Aspects of Cambrian-Ordovician boundary in Dayangcha, China, Beijing, China Prospect Publishing House: 314-373.
YIN LEIMING, 1994. New forms of acritarchs from Early Ordovician sediments in Yichang, Hubei, China. *Acta Micropalaeontologica Sinica*, 11: 41-53.

Z

ZHONG GUOFANG, 1981. Early Ordovician microflora from the Dawan Formation at Huanghuachang Yichang. *Bulletin of the Yichang Institute of Geology. Chinese Acadademy of Geological Sciences. Special Issue*: 118-124.

Manuscript received on 12.02.1995 and accepted for publication on 14.03.1995.

6. APPENDIX

Table 1. Index to Ordovician acritarch genera.
#: genus not included in the index of Fensome *et al.* (1990).

genera	first author	date	remarks	
Abacum	Fombella	1978	monospecific genus	
Acanthodiacrodium	Timofeev	1958		
Acantholigotriletes	Alyushinskii	1957	orth. var. of Acantholigotriletum	
Acantholigotriletum	Timofeev	1959	invalid genus	
Acanthorytidodiacrodium	Timofeev	1959	invalid genus	
Acanthozonodiacrodium	Timofeev	1959	invalid genus	
Acrosphaeridium	Uutela & Tynni	1991		#
Actinotodissus	Loeblich & Tappan	1978		
Actipilion	Loeblich	1970	monospecific genus	
Adorfia	Burmann	1970		
Adornofusa	Loeblich &Tappan	1978	monospecific genus	
Akomachra	Colbath	1979		
Ammonidium	Lister	1970		
Ampullula	Righi	1991	monospecific genus	#
Annulum	Fombella	1978		
Anomaloplaisium	Tappan &Loeblich	1971		
Aranidium	Yankauskas	1975		
Arbusculidium	Deunff	1968		
Archaeodiscina	Naumova	1961		
Archaeohystrichosphaeridium	Timofeev	1959		
Arcosphaeridium	Uutela & Tynni	1991		#
Aremoricanium	Deunff	1955		
Arkonia	Burmann	1970		
Aryballomorpha	Martin &Yin	1988		
Asketopalla	Loeblich & Tappan	1969	monospecific genus	
Athabascaella	Martin	1984		
Attritasporites	Combaz	1967		
Aureotesta	Vavrdova	1972	monospecific genus	
Axisphaeridium	Eisenack	1967		
Bacisphaeridium	Eisenack	1962	monospecific genus	
Baiomeniscus	Loeblich	1970		
Baltisphaera	Burmann	1970		
Baltisphaeridium	Eisenack	1958		
Baltisphaerosum	Turner	1984		
Barakella	Cramer & Diez	1977		
Beromia	Vavrdova	1986		
Bisbullatum	Fang	1986		#
Bothroligotriletes	Timofeev	1958	invalid genus	
Bresca	Fombella	1978	monospecific genus	
Bubomorpha	Yin Leiming	1985	monospecific genus	
Buedingiisphaeridium	Schaarschmidt	1963		
Caldariola	Molyneux & Rushton	1988	monospecific genus	
Carinatosphaeridium	Eiserhardt	1984	monospecific genus	
Celtiberium	Fombella	1977		
Cheleutochroa	Loeblich & Tappan	1978		
Chlamydosphaeridia	Eisenack	1971		

Cleithronetrum	Loeblich & Tappan	1978	monospecific genus	
Comasphaeridium	Staplin et al.	1965		
Comptaluta	Tappan & Loeblich	1971		
Cordobesia	Pöthe de Baldis	1977		
Cornuferifusa	Jacobson & Achab	1985	monospecific genus	
Corollasphaeridium	Dean & Martin	1982		
Coronitesta	Uutela & Tynni	1991		#
Coryphidium	Vavrdova	1972		
Costatilobus	Playford	1977		
Cristallinium	Vanguestaine	1978		
Cyclosphaeridium	Uutela & Tynni	1991	monospecific genus	#
Cymatiogalea	Deunff	1961		
Cymatiosphaera	Wetzel	1933		
Dactylofusa	Brito & Santos	1965		
Dasydiacrodium	Timofeev	1959		
Dasydorus	Playford & Martin	1984	monospecific genus	
Dasyrytidodiacrodium	Timofeev	1959	invalid genus	
Dateriocradus	Tappan & Loeblich	1971		
Deunffia	Downie	1960		
Dichotisphaera	Turner	1984	monospecific genus	
Dicommopalla	Loeblich	1970		
Dicrodiacrodium	Burmann	1968		
Dictyodiscus	Playford & Martin	1984	monospecific genus	
Dictyotidium	Eisenack	1955		
Diexallophasis	Loeblich	1970		
Diornatosphaera	Downie	1958		
Disparifusa	Loeblich	1970		
Domasia	Downie	1960		
Duplicisphaeridium	Gorka	1980	monospecific genus	
Elektroriskos	Loeblich	1970		
Elenia	Volkova	1984	monospecific genus	
Eliasum	Fombella	1977		
Enneadikosocheia	Colbath	1979	monospecific genus	
Eponula	Vavrdova	1986		
Ericanthea	Cramer & Diez	1977		#
Estiastra	Eisenack	1959		
Eupoikilofusa	Cramer	1970	illegitimate genus	
Evittia	Brito	1967		
Excultibrachium	Loeblich & Tappan	1978		
Favososphaeridium	Timofeev	1959		
Ferromia	Vavrdova	1978	monospecific genus	
Filisphaeridium	Staplin et al.	1965		
Focusphaera	Padilha de Quadros	1986	monospecific genus	
Fractoricoronula	Colbath	1979		
Frankea	Burmann	1970		
Galyxiella	Golub & Volkova	1985		#

Glaucotesta	Vavrdova	1982	monospecific genus	
Goniomorpha	Yin Leiming	1986	monospecific genus	
Goniosphaeridium	Eisenack	1969		
Gorgonisphaeridium	Staplin et al.	1965		
Gyalorhetium	Loeblich & Tappan	1978		
Hapsidopalla	Playford	1977		
Helosphaeridium	Lister	1970		
Hemisphaeridium	Hemer & Nygreen	1967		
Hoegklintia	Dorning	1981		
Holothuriadeigma	Loeblich	1970		
Hystrichotriangulatum	Andreeva	1966		
Impluviculus	Loeblich & Tappan	1969		
Izhoria	Golub & Volkova	1985	monospecific genus	
Jandiatubaites	Padilha de Quadros	1986	monospecific genus	
Joehvisphaera	Uutela & Tynni	1991	monospecific genus	#
Kladothecidium	Vavrdova	1986		
Kundasphaera	Uutela	1989	monospecific genus	#
Labyrinthosphaeridium	Uutela & Tynni	1991		#
Lacunosphaeridium	Uutela & Tynni	1991		#
Ladogella	Golub & Volkova	1985	monospecific genus	
Latoporata	Naumova & Umnova	1975		
Leioarachnitum	Andreeva	1966	monospecific genus	
Leiofusa	Eisenack	1938		
Leioligotriletes	Timofeev	1958	invalid genus	
Leiomarginata	Naumova	1961		
Leiosphaera	Eisenack	1938		
Leiosphaeridia	Eisenack	1958		
Leiosphaeridium	Staplin	1961	invalid genus	
Leiovalia	Eisenack	1965		
Leprotolypa	Colbath	1979	monospecific genus	
Likropalla	Colbath	1979		
Liliosphaeridium	Uutela & Tynni	1991	monospecific genus	#
Limaites	Padilha de Quadros	1986	monospecific genus	
Lobotheca	Vavrdova	1986	monospecific genus	
Loeblichia	Playford & Wicander	1988	monospecific genus	
Lophodiacrodium	Timofeev	1958		
Lopholigotriletes	Alyushinskii et al.	1957	orth. var. of Lopholigotriletum	
Lopholigotriletum	Timofeev	1959	invalid genus	
Lophomarginata	Naumova	1969	invalid genus	
Lophorytidodiacrodium	Timofeev	1959		
Lophosphaeridium	Timofeev	1959		
Lophozonodiacrodium	Timofeev	1959	invalid genus	
Lua	Martin & Yin Leiming	1988	monospecific genus	
Lunulidia	Eisenack	1958		
Lusatia	Burmann	1970		

Lusitanium	Elaouad-Debbaj	1981	monospecific genus	
Macroptycha	Timofeev	1973		
Marrocanium	Cramer et al.	1974	monospecific genus	
Melikeriopalla	Tappan & Loeblich	1971		
Meridinium	Vavrdova	1989	monospecific genus	#
Miaplacidus	Fombella	1978	monospecific genus	
Micrhystridium	Deflandre	1937		
Microconcentrica	Naumova	1961		
Monocrodium	Pittau	1985	monospecific genus	
Moyeria	Thusu	1973		
Multiplicisphaeridium	Staplin	1961		
Nanocyclopia	Loeblich & Wicander	1976		
Navifusa	Combaz et al.	1967		
Nexosarium	Turner	1984	monospecific genus	
Nodusosphaeridium	Uutela	1989	monospecific genus	#
Nothooidium	Loeblich & Tappan	1976	monospecific genus	
Nucellosphaeridium	Timofeev	1966		
Ocridoligotriletes	Timofeev	1958	illegitimate genus	
Ocridoligotriletum	Timofeev	1959	orth. var. of Ocridoligotriletes	
Octogonium	Martin	1974	monospecific genus	
Ooidium	Timofeev	1957		
Ordovicidium	Tappan & Loeblich	1971		
Orthosphaeridium	Eisenack	1968		
Orygmatosphaeridium	Timofeev	1959		
Ovulum	Yankauskas	1975		
Ovum	Eisenack	1931		
Pachysphaeridium	Burmann	1970		
Palaeohystrichosphaeridium	Eiserhardt	1986		
Palaiosphaeridium	Rasul	1977		
Palaiosphaeridium	Gorka	1980	illegitimate genus	
Paniculaferum	Miller	1991	monospecific genus	#
Papilliferum	Yin Leiming	1994		#
Passalosphaera	Playford & Wicander	1984	monospecific genus	
Petaloferidium	Jacobson	1978		
Peteinosphaeridium	Staplin et al.	1965		
Pheoclosterium	Tappan & Loeblich	1971	monospecific genus	
Picostella	Cramer et al.	1974	monospecific genus	
Pirea	Vavrdova	1972		
Poikilofusa	Staplin et al.	1965		
Polonosphaeridium	Gorka	1987		
Polyancistrodorus	Loeblich & Tappan	1969		
Polyedrina	Padilha de Quadros	1986	monospecific genus	
Polyedryxium	Deunff	1954		
Polygonium	Vavrdova	1966		
Priscogalea	Deunff	1961		
Priscotheca	Deunff	1961		

Protoleiosphaeridium	Timofeev	1956		
Protosphaeridium	Timofeev	1966	illegitimate genus	
Pseudolunulidia	Brito & Santos	1965		
Pterocystiopsis	Deflandre	1937		
Pterospermella	Eisenack	1972		
Pterospermopsis	Wetzel	1952		
Pulvinosphaeridium	Eisenack	1954		
Pytinomorpha	Playford & Wicander	1988	monospecific genus	
Quadruilobus	Tappan & Loeblich	1971		
Raplasphaera	Uutela	1989		#
Retisphaeridium	Staplin et al.	1965		
Revinotesta	Vanguestaine	1974		
Rhachosarium	Tappan & Loeblich	1971	monospecific genus	
Rhiptosocherma	Loeblich & Tappan	1978	monospecific genus	
Rhopaliophora	Tappan & Loeblich	1971		
Rugulidium	Cramer et al.	1974		
Safirotheca	Vavrdova	1989	monospecific genus	#
Saharidia	Combaz	1967		
Schismatosphaeridium	Staplin et al.	1965		
Schizodiacrodium	Burmann	1968		
Solisphaeridium	Staplin et al.	1965		
Staplinium	Jansonius	1962		
Stellechinatum	Turner	1984		
Stelliferidium	Deunff et al.	1974		
Stelomorpha	Yin Leiming	1994	monospecific genus	#
Stenozonoligotriletes	Timofeev	1958	invalid genus	
Stenozonoligotriletum	Timofeev	1959	orth.var. of Stenozonoligotriletes	
Stephanodiacrodium	Vavrdova	1986	monospecific genus	
Strablosphaeridium	Gorka	1980	monospecific genus	
Striatotheca	Burmann	1970		
Sulcatosphaeridium	Umnova and Yakovlev	1970	invalid genus	
Sylvanidium	Loeblich	1970		
Symplassosphaeridium	Timofeev	1959		
Synsphaeridium	Eisenack	1965		
Synsphaeridium	Timofeev	1966	illegitimate genus	
Taeniosphaeridium	Uutela &Tynni	1991		
Tariccrodium	Pittau	1985		
Tasmanites	Newton	1875		
Tectitheca	Burmann	1968		
Tenuirica	Playford & Wicander	1988	monospecific genus	
Tetradinium	Vavrdova	1973	illegitimate genus	
Tetraniveum	Vavrdova	1976	illegitimate genus	
Timofeevia	Vanguestaine	1978		
Tongzia	Li Jun	1987	monospecific genus	
Trachydiacrodium	Timofeev	1959		
Trachyoligotriletes	Timofeev	1958		

Trachyoligotriletum	Timofeev	1959	orth. var. of Trachyoligotriletes	
Trachyrytidiacrodium	Timofeev	1959		
Trachysphaeridium	Timofeev	1959		
Trachyzonodiacrodium	Timofeev	1959	monospecific genus	
Tranvikium	Tynni	1982	monospecific genus	
Trematoligotriletum	Timofeev	1959		
Trematosphaeridium	Timofeev	1959		
Tretosohyrtana	Colbath	1979		
Tricholigotriletum	Timofeev	1959	invalid genus	
Trichosphaeridium	Timofeev	1969		
Trilobatum	Fang	1986	monospecific genus	#
Tunisphaeridium	Deunff & Evitt	1968		
Tylotopalla	Loeblich	1970		
Uncinisphaera	Wicander	1974		
Uniporata	Naumova	1969	invalid genus	
Uranidium	Jacobson & Achab	1985	monospecific genus	
Vavososphaeridium	Timofeev	1959		
Vavrdovella	Loeblich & Tappan	1976	monospecific genus	
Velatasphaera	Miller & Williams	1988	monospecific genus	
Veryhachium	Deunff	1954		
Villosacapsula	Loeblich & Tappan	1976		
Virgatasporites	Combaz	1967		
Vogtlandia	Burmann	1970		
Vulcanisphaera	Deunff	1961		
Wilsonastrum	Jansonius	1962	monospecific genus	
Winwaloeusia	Deunff	1977		
Yichangia	Yin Leiming	1994	monospecific genus	#
Zonooidium	Timofeev	1957		
Zonosphaeridium	Timofeev	1959	invalid genus	