m; Belv68, 231.88 m (Serravallian); Belv54, 205.86 m; Belv42, 179.51 m; Belv32, 162.18 m; Belv17, 146.59 m; Belv7 135.66 m; Belv1, 130.35 m (Tortonian)] were studied. The samples were collected based upon biostratigraphic and isotopic criteria. The samples were prepared following standard treatment with HCl, HF and $ZnCl_2$. The residue was sieved at 15µm and strew mounts were prepared.

The preservation of the palynomorphs is good. Samples Belv7 and Belv1 (Upper Tortonian) are almost barren. Palynomorphs are scarce (n<50 in one slide) in Belv387 (Aquitanian), Belv329, Belv292 and Belv237 (Burdigalian). In Pa1, Belv387, Belv344, Belv292, Belv237, Belv133, Belv107, Belv83, Belv68, Belv42, Belv32 and Belv17 spores/pollen are more common than dinoflagellates. Dinoflagellates are particularly frequent (n>100) in samples from the Burdigalian (Belv253, Belv187, Belv160), Langhian (Belv120, Belv107), Serravallian (Belv83) and Tortonian (Belv54, Belv17).

The poor spore-pollen assemblages are dominated by the Pinaceae. They are abundant in the Aquitanian (Pa1, Belv344), reduce during the remaining Lower Miocene and are very abundant in the Middle and Upper Miocene. Less frequent are spores (Ricciaceae, Sphagnaceae, Pteridaceae), and angiosperms (Asteraceae, Poaceae, Plumbaginaceae). A few acritarchs and peridinioids are represented in the Upper Burdigalian to the Tortonian. The acritarchs *Cyclopsiella granosa*, *Pterospermella* sp. and *Quadrina* sp. occur. *Selenopemphix nephroides*, *S. brevispinosa* and *S. dinaeacysta* are the most common peridinioids. The presence of peridinioids and acritarchs in the Tortonian suggests a shallow marine brackish environment rich in nutrients.

Twenty-eight gonyaulacoid taxa were identified. They are very abundant (n>300) during Upper Burdigalian (Belv187), Langhian (Belv120), Serravallian (Belv83) and Lower Tortonian (Belv54); they are abundant (n>100) in the Burdigalian (Belv253, Belv106) and Langhian (Belv107); they are absent in Belv237, Belv7 and Pa1; in other samples they are scarce (n<50).

During the Burdigalian, *Polysphaeridium zoharyi*, *Cribroperidinium tenuitabulatum*, *Systematophora placacantha* and *Lingulodinium* sp. are represented. In the Langhian, *Apteodinium australiense* is very abundant and *Operculodinium centrocarpum* and *O. israelianum* are common. *Spiniferites* sp., *Spiniferites/Achomosphaera*, *Hystrichosphaeropsis obscura*, *Lingulodinium machaerophorum* and *O. israelianum* are frequent in the Serravallian. *Lingulodinium machaerophorum*, *Homotryblium vallum*, *Spiniferites/Achomosphaera*, *S. pseudofurcatus* and *O. israelianum* are common during the Tortonian.

Belverde was under continuous marine influence during the Miocene. The abundance of dinoflagellate cysts indicates littoral environments during the Burdigalian and Tortonian.

ANTUNES, M.T., LEGOINHA, P., CUNHA, P. & PAIS, J. (2000). High resolution stratigraphy and Miocene facies correlation in Lisbon and Setúbal Peninsula (Lower Tagus basin, Portugal). **Ciências da Terra,** Lisboa, 14: 183-190.

PAIS, J., LOPES, C., LEGOINHA, P., RAMALHO, E., FERREIRA, J., RIBEIRO, I., AMADO, A., SOUSA, L., TORRES, L., BAPTISTA, R. & REIS, R.P. (2002). The Belverde Borehole (LTB, Setúbal Peninsula, Portugal). **XVIII J. Soc. Esp. Paleont., II Cong. Ibér. Paleont., RCANS Int.-Colloq.**, Salamanca: 198-199.

Poster session g2

PRE-CAMBRIAN PALYNOLOGY/CIMP SYMPOSIUM

Microfossils from the Upper Vendian, Volyn, Ukraine

Ivanchenko, K.

Institute of Geological Sciences, Department of Mineral Resources Geology, O.Gonchara Str., 01601, Kiev, Ukraine.

The field of my research was the Vendian microfossils, which have been studied with the help of optical microscope.

Earlier, the Vendian paleontology of Volyn were studied by Timofeev B.V., Shepeleva O.D., Asseyeva O.A., Burzin M.B., Kiryanov V.V.

In the argillite samples from bore-holes in Volyn, Ukraine there have been found two associations of microfossils: one in the Mogyliv-Podilska series and another in the Kanylivska one.

The first one is represented by *Spumosina rubiginosa Andr.*, *Botuobia wernadskii* (Schep.), *Circumiella mogilevica* Ass., *Obruchevella valdaica* (Schep.) Ass., *Leiosphaeridia atava* (Naum.), *L. crassa* (Naum.), *L. exsculpta* Tim., *L. jacutica* (Tim.), *L. laminarita* Tim., *L. minutissima* (Naum.), *L. obsuleta* (Naum.), *Stictosphaeridium sinapticuliferum* Tim. *Circumiella mogilevica* Ass., *Obruchevella valdaica* (Schep.) Ass. are characteristic only of the lower part of the Mogyliv-Podilska series.

The second one is represented by *Leiosphaeridia atava* (Naum.), *L. crassa* (Naum.), *L. exsculpta* Tim., *L. jacutica* (Tim.), *L. minutissima* (Naum.), *L. obsuleta* (Naum.), *Botuobia wernadskii* (Schep.), *Stictosphaeridium sinapticuliferum* Tim., *Synsphaeridium*, *Cochleatina canilovica* (Ass.), *Cochleatina rara* (Pask.). Apart from this, different filamentous algae and organic films are met. Of special importance are spiral large forms of *Cochleatina* as they have rather narrow stratigraphic distribution (the Lower Cambrian-Kanylivska series from the Upper Vendian). This allows to recommend them as an index genus for determining the age of boundary layers of the Cambrian and Pre-Cambrian.

The obtained results confirmed the stratigraphic division of the Upper Vendian into two series.

Neoproterozoic (Ediacaran) radiation of Acritarchs – a new record from the Murnaroo 1 Drillcore, Officer Basin, Australia

Willman, S.

Uppsala University, Department of Earth Sciences, Palaeobiology, Norbyvägen 22, SE-752 36 Uppsala, Sweden.

The terminal Neoproterozoic radiation of planktonic photosynthetic microbiota (acritarchs) is one of the most significant evolutionary events of the time, including diversification of prokaryotic cyanobacteria and eukaryotic green and brown algae, the appearance of thecoamoebaens and subsequently metazoans (the Ediacara fauna). The Ediacaran radiation of phytoplankton is recognizable by the first appearance of more than fifty new species of large ornamented acritarchs in a short interval of time at ca. 570 Ma. This radiation event occurred after the Snowball Earth conditions returned to a kind of "normal" environmental stasis, and it may be interpreted as a recovery diversification of phytoplankton after a major biotic extinction caused by the global glaciation.

The appearance of numerous, morphologically innovative and large acritarch taxa may also be connected with the Acraman impact event in South Australia, suggested recently by Grey et al. (2003), as a biotic recovery after the catastrophic environmental disturbance caused by the giant bolide. The latter hypothesis has to be tested, however, because a few individual taxa of ornamented acritarchs may have actually appeared below the ejecta layer, which is difficult to recognize with certainty in some borehole successions.

The Ediacaran acritarch records are from Australia (the Officer and Amadeus Basins), China and Siberia, showing a worldwide distribution in a relatively short interval of time (ca. 20 Ma; Grey, 2004, in press). The greatest taxonomic diversity is known from Australia (ibidem), and the present study is focused on the investigation of Ediacaran microbiota in greater detail and from different stratigraphic levels, their palaeobiology and affinities, mode of life and reproduction cycle. The new assemblage of organic-walled microfossils from the Murnaroo 1 borehole comprises filamentous cyanobacteria, and ornamented and spheroidal acritarchs.

The Ediacaran successions in Australia have been well documented in terms of lithostratigraphy, depositional settings and structural geology. The sedimentation proceeded in two different depositional regimes, recognized today in a series of sub-basins. One of them is the Officer Basin, comprised of complex intracratonic, east-west trending troughs and sub-basins extending from Western Australia to South Australia. The studied Murnaroo 1 borehole is also located there. The sediments accumulated in tidal, sub- and intertidal shelf conditions, and the predominantly mudstone lithology from which the samples were collected, is ideal for palynological processing and preservation of microfossils. The lack of macrofossils in the successions rendered efforts and advances in acritarch biostratigraphy since the 1980's, which helped to reveal a complex history of the Officer Basin. The discovery of two distinct palynofloras, an older leiosphere-dominated flora (ELP) and a younger acanthomorph-dominated flora (ECAP), is suggested to be largely environmentally independent (Grey, 2004, in press) in terms of the observed lithology and sedimentological sequences. However, the possible coupling between the Marinoan glaciation, the Acraman impact and the radical change in the palynofloras was inferred (ibidem) and this will be examined with the new data available from the Murnaroo 1 borehole. Previously, the Murnaroo succession was only studied preliminarily.

In my communication, I will discuss the stratigraphic sequence of appearances of various species and their relationship to the environmental conditions, the Acraman impact event and the changes associated with the global glaciations.

GREY, K., WALTER, M.R. and CALVER, C.R. (2003) Neoproterozoic biotic diversification: "Snowball Earth" or aftermath of the Acraman impact? *Geology* 31, p. 459-462.
GREY, K., (2004, in press) Ediacarian Palynology of Australia. *Australasian Association of Palaeontologists, Memoirs.*

Systematic perspective of Acritarcha group

Stanevich, A. M.

Institute of the Earth's Crust SB RAS, 664033, Lermontov str., 128, Irkutsk, Russia.

Organic-walled microfossils (OM) are considered in Acritarcha Evitt, 1963, which differs from other classifications by deficiency of a natural - taxonomic basis. The separation of species, genera and subgroups of acritarchs to morphological features is only convenient for formal diagnostics, but it is represented unperspective in phylogenetic aspect. The organisms evolutionary hierarchy of Phanerozoic is established within the lowest categories (genera, families) of natural - taxonomic classifications by change of features of their forms. Majority microfossils of Proterozoic is the remains of different groups of algae and bacteria. Considering high degree of convergence of features of their forms, acritarchs from one subgroup can concerns not only to different divisions, but also to different kingdoms of the organic world.

The forms assemblage having character to resist lithostatic pressure and to keep volume of the bodies at fossilization among OM is known. The distinct integrity of volume of the forms and their internal features clearly shows initial and probably genetic difference of this type of OM, which are flattened at a primary stage of lithification. Various "volumetric" OM in more than one hundred localities in the south of the Siberian platform and in other regions are known. Here they are in one layers together with more known, "flattened" acritarchs. Character of the forms to keep volume was taken as feature of a new acritarchs subgroup Implethomorphitae Jank. et Mikh., 1989. However the given feature appears (from the view-point of primary nature of this character) as a discord concerning formal diagnostics of Acritarcha taxons. Furthermore number of the forms (part of Micrhystridium Defl., em. Downie et Sar., Octoedrixium Rud., em. Vid.; etc.) from other Acritarcha subgroups also have the character to keep volume at fossilization.

The group Acritarcha Evitt, 1963 was proposed to be divided into sub-groups : Impethomorphi (Jank. et Mikh., 1989), Stan., comb. nov., Oblidomorphi (Stan., 1997), Stan., nom. mut., 2003 and Incertae sedis (Stanevich et al., 1997, on Russian; Stanevich, 2003, SPIE, V. 4939). The offered division is only preliminary variant of classification, which basis offers the following rules.

The group Acritarch Evitt, 1963 is divided into sub-groups different in non-morphological criteria. The latter inclludes the features indicating the statistically significant possibility of biological detachement of the forms. Such features can be represented by environment, resistancy to metamorphism, chemical content and others. The sub-groups are divided into infra-groups which are different in types of implicit affinity such as morphological, ecological and possibly others. At that, the main part of existing sub-groups become the infra-groups. The names of sub-groups and infra-groups are not typed, and they have the status of the experiment which allow the vary or enlarge their diagnosis and volume up to creating reglamenting summary. A rare ending " i " is given to the new sub-groups. The typical genera of the sub-groups and infra-groups are not established. The species and genera are different in morphological features.

The classification variant offered here is based on different principles of recognizing supra-generic taxons and is still experimental which corresponds to the term "Acritarcha". It appears that division of acritarchs only by morphological evidence in some argumental points retards the progress of biological interpretations and discernment evolution of Precambrian algae and bacteria in particular. The available and future natural differences of microfossils may be reflected in the modified classification of acritarchs which can be created by means of desire and interaction of microphytologists from different regions.

Poster session g3

LOWER PALAEOZOIC PALYNOLOGY/CIMP SYMPOSIUM

Darriwilian (Middle Ordovician) acritarch and prasinophyte assemblages from the Upper Dawan and Shizipu formations (Yangtze Platform, S. China) and the Šárka Formation (Barrandian area, Czech Republic)

Fatka, O.[1] & Brocke, R.[2]

[1] Karlova Univerzita, Přírodovědecká fakulta, Ústav geologie a paleontologie, Albertov 6, CZ-14321 Praha 2 (Czech Republic).
[2] Forschungsinstitut Senckenberg, Senckenberganlage 25, D-60325 Frankfurt/M. (Germany).

Lower and Middle Ordovician sediments from the Yangtze Platform (South China) and the Barrandian area (Czech Republic) are characterized by common and well diversified assemblages of different fossil groups, including organic walled microfossils (OWM), such as acritarchs, prasinophytes and chitinozoans. During the Ordovician both areas were located in different parts of the peri-Gondwanan sea. A position from intermediate to low palaeolatitudes has been documented for the Yangtze Platform while a placement of the Barrandian are is supposed to correspond to high southern palaeolatitudes. Both studied areas sections are well dated by graptolites (Barrandian area) and/or by graptolites and conodonts (South China), repectively.

However, the composition of OWM assemblages throughout the transition from the Lower to the Middle Ordovician shows very similar diversification and evolution trends in both areas. An example of comparable trends in the development of acritarch and prasinophyte assemblages has been recently established within the Middle Ordovician sequence, namely above base of the Darrwillian Stage. This stratigraphic interval is characterized by a global transgressive event (CHEN & BERGSTROM 1997).

Diversification and evolutionary trends in acritarch and prasinophyte assemblages.

BROCKE et al. (2000) distingushed four acritarch assemblages (designated as *A* to *D*) within upper Arenigian – lower Llanvirnian sequences on the Yangtze Platform. The undelying assemblages *A*, *B* and also the overlying assemblage *D* are highly diversified. But assemblage *C* (coming from the *U. austrodentatus* graptolite zone and thus corresponding to the base of the Darrwilian Stage) is characterized by a common occurrence of large representatives of the prasinophyte genus *Leiospharidia* associated with poorly to moderately diversified acritarchs.

Comparable results regarding diversification trends in acritarch and prasinophyte assemblages have been also documented from the Barrandian sections by FATKA (2003 - locality Praha - Cervený vrch and FATKA et al., 1996 - locality Rokycany – Drahous).

The comparison of of acritarch and prasinophyte assemblages in association with with a transgressive event in moderately to deeper water environments of different palaeolatitudinal position, enables to reconstruct changes in diversity and productivity among the primary producers.

BROCKE, R., LI, J. & WANG, Y. 2000. Upper Arenigian to lower Llanvirnian acritarch assemblages from South China: a preliminary evaluation. **Rev. Palaeobot. Palynol.** 113: 27-40.
CHEN, X. & BERGSTROM, S. 1997. The base of austrodentatus Zone as a level for global subdivision of the Ordovician system. **Palaeoworld** 5: 1-117.
FATKA, O. 2003. Organic-walled microfossils (Chitinozoa and Acritarcha) from the Praha - Červený vrch (Šárka Formation, Middle Ordovician, Prague Basin). **Bull. Geosci.** 78: 119-127.
FATKA, O., KRAFT, J. & KRAFT, P. 1996. Paleontological stratigraphical relations on the Arenig - Llanvirn boundary in the Prague Basin (Ordovician, Bohemia). in Baldis, B. & Acenolaza, F.G. (eds.): El Paleozoico inferior en el nortoeste del Gondwana. **INSUGEO, Series Correlación Geológica**: 263-264.