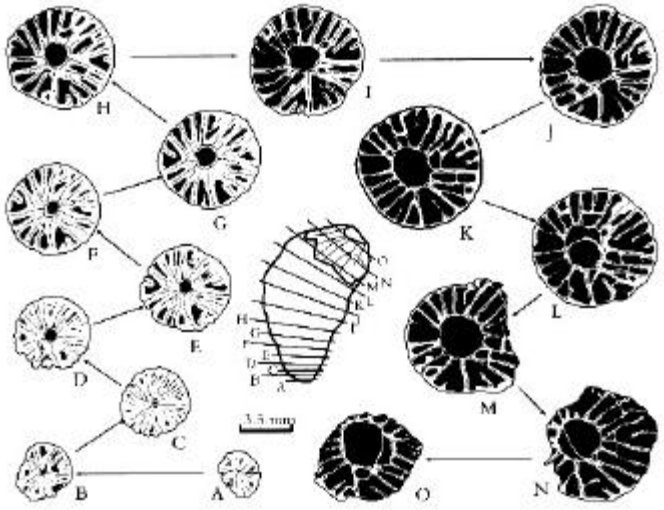
Fossil

Cnidaria & Porifera



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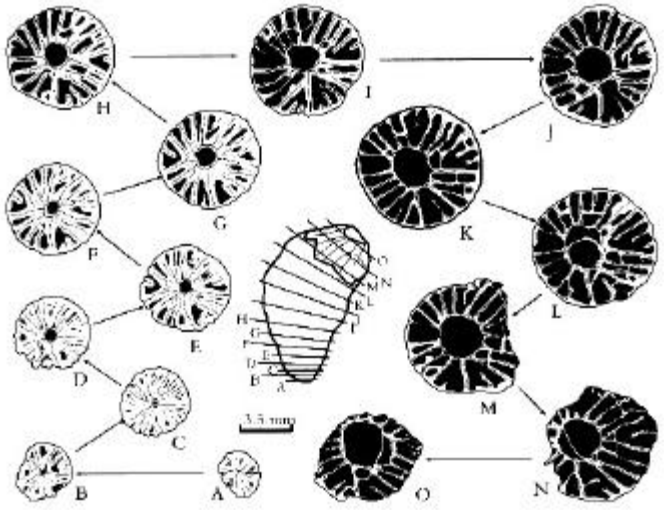
Tabulata/Heliolitida Kl. Oekentorp

Mes. /Cenozoic Corals H. Loeser
Archaeocyathida E. Moreno-Eiris
Stromatoporoidea C. W. Stearn
Porifera s. str. D. Janussen

Fossil

Cnidaria & Porifera



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Contents

Editors ' note

Dear colleagues,

This is our first issue of the newsletter as the new editors and we are indebted to Klemens Oekentorp and Stefan Schroeder for their long-term editorial contributions, which always made the newsletters interesting and informative. We will do our best to maintain their high standards in the future newsletters and keep them up-to-date.

We are grateful to those individuals who contributed data for inclusion in this issue and those who assisted in its preparation. The primary aim of " Fossil Cnidaria & Porifera " is to promote the interdisciplinary collaboration and progress, as well as understanding among members of the association. Within this scope " Fossil Cnidaria & Porifera " serves as the newsletter for the announcement of general information and as a platform for discussion of developments in the field of fossil Cnidaria and Porifera. Thus we encourage publication of announcements, literature reviews and comments, progress reports, current research projects and programs, group activities, field work, international cooperations, preliminary notes etc, in which you or colleagues in your country are involved. Unfortunately, however, in this new issue there is a shortage of reports group activities, international cooperative efforts, and discussions.

The format of this issue is similar to that of previous issues, although a slight change has been made in several parts. In " news and views ", we only include publication lists and have deleted the abstracts because the reader can easily find the abstracts in the bibliography that is arranged in alphabetic order by author.

The new issue (Volume 33. 1) of “Fossil Cnidaria and Porifera” is also acceptable in the webesite < www. cnidaria. cn>.

We look forward to receiving your news.

With best wishes to all,

Xiangdong WANG
Tomasz WRZOLEK

Front cover: Series of transverse sections of the holotype Commutia exoletus Wang, Sugiyama et Zhang 2004, figure 4. -Wang X. D. , Sugiyama T. and Zhang F. , 2004. Intraspecific variation in a new solitary rugose coral, Commutia exoleta, from the Lower Carboniferous of the Baoshan Block, Southwest China. Journal of Paleontology 78(1): 77-83.

Correspondents

Correspondents are asked to collect and send News and Views, e. g. about what happens in coral research in their region to the editors. We depend on your cooperation to make Fossil Cnidaria & Porifera a living and current journal. But this call includes also the responsibility of all specialists to inform their correspondents.

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Czech Republik	A. GALLE / J. HLADIL
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United States of America	A. F. BUDD & C. W. STOCK

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Stromatoporoids	C. W. STEARN
Porifera	D. JANUSSEN
Pre -Carboniferous corals	M. COEN -AUBERT
Carboniferous & Permian Corals	G. WEBB
Tabulata and Heliolitda	Kl. OEKENTORP

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The Association

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Stefan Schroeder / Germany / 1999- 2003 / 2003- 2007
Ewa Roniewicz / Poland / 1999- 2003 / 2003- 2007
Tetsuo Sugiyama / Japan / 1999- 2003 / 2003- 2007
Stephen Kershaw / U. K. / 2003- 2007

Secretary
Bernhard Riegl / USA / 2003- 2007

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Australasia and others: 5 votes
Gregory Webb / Australia / 2003- 2007
Yasufumi Iryu / Japan / 1999- 2003 / 2003- 2007
Yoichi Ezaki / Japan / 1999- 2003 / 2003- 2007
Wang, Xiang -Dong / PR China / 1999- 2003 / 2003- 2007
Wang, Xun -Lian / PR China / 2003- 2007

The Americas: 3 votes
Graham A. Young / Canada / 1999- 2003 / 2003- 2007

Carl W. Stock / USA / 1999- 2003 / 2003- 2007
Kenneth G. Johnson / USA / 2003-2007

Europe I: 6 votes
Edouard Poty / Belgium / 1999- 2003 / 2003- 2007
Jean -Pierre Cuif / France / 1999- 2003 / 2003- 2007
Christine Perrin / France / 1999- 2003 / 2003- 2007
Francisco Soto / Spain / 1999- 2003 / 2003- 2007
Ian Somerville / Ireland / 2003- 2007
John Nudds / UK / 2003- 2007

Europe II: 5 votes
Michael Rasser/ Austria, Switzerland / 2003- 2007
Hannes Loeser / Germany / 1999- 2003 / 2003- 2007
D. Janussen / Germany / 1999- 2003 / 2003- 2007
Heldur Nestor / Estonia / Scandinavia / 1999- 2003 / 2003- 2007

Europe III: 4 votes
Arnost Galle / Czech Republic / 2003- 2007
Tomasz Wrzolek / Poland / 1999- 2003 / 2003- 2007
Irene Yu. Bugrova / CIS / 1999- 2003 / 2003- 2007
Olga L. Kossovaya / CIS / 1999- 2003 / 2003- 2007

Obituaries

Professor Dr. Otto Franz Geyer

18. 05. 1924 at Bergreichenstein / Böhmerwald
18. 11. 2002 at Staufen / Breisgau

In 1946/47 Prof. Geyer started his study of Biology at the Technische Hochschule Stuttgart- but changed to Geology and Palaeontology in 1948. With his thesis "Die oberjurassische Korallenfauna von Württemberg" he finished his studies in 1952. Between 1952 and 1961 he worked as assistant professor at the Geologisch-Paläontologisches Institut of the Technische Hochschule Stuttgart. In 1959 he finished his Habilitation with a work: "Monographie der Perisphinctidae des unteren Unterkimmeridgium (Weißer Jura γ, Badenerschichten) im süd-deutschen Jura". With that the venia legendi was bestowed on him. Thesis and Habilitationsschrift already marked his main field of work: Mesozoic corals and ammonoids, but he was interested in stratigraphy and paleogeography as well. Widely known is his text-book "Grundzüge der Stratigraphie und der Fazieskunde", which was published in two volumes in 1973. List of his works contains 115 publications.

His obituary has been published by Winfried Reiff, Stuttgart:

Reiff W. 2003. Otto Franz Geyer, 1924-2002. -Jh. Ges. Naturkde. Württemberg **159**, pp 291-303, 1 fig. , 1 portrait; Stuttgart.

[obituary presented by Klemens Oekentorp]

Professor Dr. Erik Flügel

07. 04. 1934 Fürstenfeld, Österreich

14. 04. 2004 Erlangen, Deutschland

Prof. Dr. Erik Flügel, Emeritus, Chair-holder and founder of the Institut für Pal ontologie der Universit t Erlangen-Nürnberg and Member of the International Association for the Study of Fossil Corals and Porifera passed away on April 4th 2004-only 8 days after his 70th birthday. He was an international recommended and well known as well as an esteemed scientist. He was a passionate researcher, unremitting organizer in science and an appreciative colleague.
For a more comprehensive obituary see topic "Aktuelles" on web-site: >www. cold-corals. de<
[obituary presented by Klemens Oekentorp]

Professor Dr. Alexander von SCHOUPPE

26. Februar 1915 in Baden near Vienna, Austria
06. July 2004 in Münster, Germany

Prof. Dr. Alexander von Schoupp é, Nestor of German coral research and long standing member of the International Association for the Study of Fossil Cnidaria and Porifera, was an international recommended and esteemed scientist as well as a passionate researcher and University teacher. He has been revered by his students and colleagues, and he was always a trustworthy friend.

Alexander von Schoupp é studied Geology, Pal ontology and Mineralogy at the Karl-Franzens University in Graz, supervised by the famous Prof. Dr. Franz Heritsch. On May, 26. 1939, after finishing his thesis on "Die Coelenteratafauna des e-gamma der Karnischen Alpen" he became "Dr. phil."

and assistant at the Geological Institute Graz. During the World War II he was assigned to the German Air Force where he served as metereologist in a remote scout plane. He survived three downings.

After the war he returned to Graz. In 1948 and with an investigation on morphogenesis and systematics of the coral genus *Thamnophyllum* [Die Thamnophyllen und ihre Beziehung zur Gruppe des *Cyathophyllum caespitosum*], the venia legendi in Palaeontology was bestowed on him and, following in 1952, the *venia legendi* in Geology with a paper on hydrogeological studies on the genesis of the Gleichenberg mineral springs [Hydrogeologische Studien zur Genesis der Heilquellen von Gleichenberg]

In 1953 Alexander von Schoupp é was appointed to the University at M ü nster to establish the branch of Paläeontology at the Geologisch-Paläontologisches Institut and Museum [Director Prof. Dr. Franz Lotze] where, in 1956, he became extraordinary professor and in 1965 Wissenschaftlicher Rat and senior professor. Between 1973-1975 he was the Dean of the Geosciences .

Honouring his engagement for fossil corals, he was appointed director of the newly founded Forschungsstelle f ü r Korallenpaläozoologie [Research-Branch for Fossil Corals]in 1964. His scientific activities were influenced by his love of Palaeontology as well as Geology, but the study of fossil, especially Palaeozoic corals now developed as a main research subject.

Work was focused on two projects: joint descriptions of coral faunas with his students and scientific assistants, for example from Northern Spain (Devonian of Asturias) and from Indonesia (Permian of Timor). Based on these investigations the morphogenesis of the coral skeleton became a long term project, continuously supported by the Deutsche Forschungs Gemeinschaft [DFG; German Research Foundation]. In this connection and in cooperation with Prof. Dr. G. Pfefferkorn and Dr. J. Vahl, both of the Institut f ü r Medizinische Physik Universität M ü nster, the arising SEM/TEM technology was used to interpret microstructures of the

coral skeleton, including its smallest units, the crystallites in their three-dimensional arrangement. This was the first time that scanning microscopy was introduced in coral research and in Palaeontology.
However, a lot of unsolved problems remained, above all the nature of the so called zigzag -pattern of crystal arrangement in walls and septa. But at the end of the sixties, at least, it could be proven-based of huge collections of thin sections-that this structure is not a primary one but caused by diagenetic processes. First hesitating because of the contradiction to his long lasting investigation, he accepted and promoted this new insight-showing scientific and personal notability.

The results of his research activities found world-wide acceptance, and in 1961, he was invited by the Polish Academy of Science. Many colleagues stayed in Münster for co-operation and for discussions of problems in coral research. And it was a special honour to him, to participate the 6th. International Symposium on Fossil Cnidaria and Porifera in Münster. Aged 85 he contributed a paper "Episodes of coral research history up to the 18th century" - really a second thesis. In 1989 the Karl-Franzens Universität Graz/Austria honoured him with the Golden Doctor-Graduation.

Von Schoupp é was popular with his students, although he was very consistent concerning science. But never he forgot human aspects,- appreciative and ready to help. We - generations of students-like to remember him and we are grateful for the comprehensive palaeontological education and the insights into evolution of life.

For Biography, Reference-list etc. see: www. korallen.
de/EXHTML/SHOUPE/HTM

[obituary presented by Klemens Oekentorp, Münster, 16. July 2004]

News and Views

Australia (by G. Webb)

Dr. J. E. N. (Charlie) Veron of the Australian Institute of Marine Science in Townsville, Queensland was awarded the Darwin Medal, the most prestigious award given by the International Society for Reef Studies at the Tenth International Coral Reef Symposium in Okinawa, Japan, 28 June to 2 July, 2004. The medal is presented every four years at the International Coral Reef Symposium to a senior ISRS member who is recognized worldwide for major contributions throughout her/his career.

John Pickett spent five weeks in the field, chiefly in southern Western Australia, with Andrzej Pisera (Warsaw) and Paul Gammon (Adelaide; Ottawa), collecting Eocene sponges. The haul was fantastic; millions, literally, of sponges, mostly lithistid, but also forms in which the spicules are felted, not fused, sometimes perfectly weathered out and lying under sheltered overhangs. The taxonomy is being enthusiastically undertaken by Andrzej. Another project is on Silurian corals from Austria, and the ongoing one on those from the Molong Limestone in NSW.

Gregg Webb hosted Markus Aretz, now at Universtät Cölne, for a postdoctoral position to work on Mississippian syringoporoids and reefs in the Rockhampton Group. Webb is also carrying out geochemical studies on modern and fossil sponges with Gert Wörheide (Göttingen), and his PhD student Luke Nothdurft is studying scleractinian coral microstructure and early diagenesis utilising five new

shallow cores recovered from Heron Reef, Great Barrier Reef in 2003.

Canada (by R. J. Elias and G. Young)

Bob Elias(University of Manitoba) and Graham Young (Manitoba Museum, adjunct professor at U of M) welcome inquiries and applications from students interested in graduate studies (see <http://www. umanitoba. ca/geoscience/faculty/elias/elias. html>). M. Sc. and Ph. D. projects are available on all aspects and applications of Paleozoic corals. There are also interesting projects related to Lower Paleozoic paleoecology and stratigraphy.

Graham and Bob are leading a collaborative project on spectacular Late Ordovician-Early Silurian rocky shorelines exposed in the Churchill area of northern Manitoba. An extensive ancient archipelago can be delineated, with a record of environmental and biotic change as sea level fluctuated. Data from drillcore obtained in 2003, and from fieldwork in previous years, will permit three-dimensional reconstruction. This study has significant implications to our understanding of the paleoecology and taphonomy of corals and other groups in a unique setting.

Bob and Graham continue to work on the diversity, paleoecology, and community structure of Late Ordovician to earliest Silurian coral faunas. Patterns of evolution and biogeography are being related to major transgressive-regressive cycles and paleoceanographic parameters. Comparative analyses of pre-extinction, post-extinction, and recovery faunas contribute to an understanding of biotic response to environmental change.

Adam Melzak is completing a Ph. D. dissertation on rugose corals from Anticosti Island, Québec-site of the world's most complete coral-bearing succession across the Ordovician-Silurian boundary. This will contribute data on extinction and recovery in a continental-margin setting. Shaochun Xu (former Postdoctoral Fellow) and Bob are working on latest Ordovician coral faunas of South China. These results will be synthesized with those from

North America, providing a broader perspective of biotic change resulting from the mass extinction.

In 2003, Raegan Porter completed a B. Sc. thesis on refined biometric methodology for distinction of colonial coral species, based on a rugosan genus from the Upper Ordovician "Tyndall Stone" of southern Manitoba. She is now an M. Sc. student, conducting a paleoenvironmental and paleoecological reconstruction of a stromatoporoid/coral-rich Silurian unit in southern Manitoba. D-J Lee (Andong National University, Korea) and Bob are examining modes of corallite increase in tabulates from "Tyndall Stone" and from the Middle Ordovician of Tennessee. New discoveries are challenging existing models concerning the paleobiology and evolutionary relationships of early tabulate corals.

Graham is completing a large project with Steve Kershaw (Brunel University, England) on growth banding in Paleozoic stromatoporoids and colonial corals, comparing material from Manitoba with specimens from Gotland, Sweden. Graham and Shaochun Xu are studying remarkable Late Ordovician coral-stromatoporoid intergrowths from South China. This is the first thorough documentation of such intergrowths before the Late Ordovician extinction, and may affect our understanding of the evolution of benthic communities.

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1. Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences(by Xiangdong WANG)

Xiangdong WANG

After completing a database of Chinese corals from the Devonian through the Permian, my colleagues and I are analyzing the following pattern or patterns: (1) diversity and biogeography, (2) coral extinction across the Frasnian-Famennian, (3) recovery in the Early Carboniferous, (4) radiation in the Carboniferous and Permian, and (5) extinction at the end of the Middle Permian and end of the Late Permian. We are looking for possible links between diversity pattern and geochemical excursions in South China. The geochemical work is in cooperation with Prof. Werner Buggisch (University of Erlangen, Germany) and Dr. H. S. Mii (Taiwan Normal University).

My systematic emphasis is on the Late Paleozoic especially Carboniferous and Permian rugose corals. I am completing a monograph of Early Carboniferous rugose corals from western Yunnan, Southwest China. Other current taxonomic works include: (1) Late Permian rugose corals from a seamount carbonate block in northwestern Tibet, (2) Carboniferous and Permian rugose corals from Central Iran (with M. N. Gorgij, Iran), (3) Permian rugose corals from western Yunnan (with T. Sugiyama, Japan), and (4) Permian rugose corals from western Thailand (with P. Chaodumrong, Thailand).

Currently, four graduate students are working with me. Feng ZHANG (a doctoral student) is studying Ordovician tabulate corals with supervisional help from Prof.

Dr. Dongjin LEE (Korea) and retired professor Zhanqiu DENG (Nanjing, China). Xiaojuan WANG (a doctoral student) is studying Permian rugosan corals. Yuping QI (a doctoral student) is studying Carboniferous and Permian conodonts with supervisional help from Zhihao WANG (Nanjing, China). Yeqiang ZHANG (a Master's student) is studying carbonate sedimentology and microbial reefs.

Three of my research projects are currently funded as follows: (1) Classification and evolution of the Carboniferous and Permian Kepingophyllidae and environmental implications (2003-2005, financed by National Natural Science Foundation of China), (2) Studies on potential Paleozoic stratotype sections in China and their quantitative analyses (2003-2005, financed by Chinese Academy of Science), and (3) Late Paleozoic biotic radiation, extinction, and recovery (2000-2005, financed by Ministry of Science and Technology, China).

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Shen S. Z. , Cao C. Q. , Shi, G. R. , **Wang X. D.** & Mei S. L. 2003. Lopingian (Late Permian) stratigraphy and deposition in southern Tibet and its correlation over the peri-Gondwana region. Newsletters on Stratigraphy 39(2/3):157-179.

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Wang Z. H. , Qi Y. P. , **Wang X. D.** , & Wang Y. J. , 2004. Restudy of the Upper Carboniferous (Pennsylvanian) strata from Nashui of Luodian, Guizhou. Acta Micropalaeontologica Sinica 21(2), 111-129. (in Chinese with English abstract)

Weihua LIAO

He is working in the Hongguleleng coral fauna, northern Xinjiang with cooperation of Dr. S. Schroeder (Germany). The corals are from Upper Devonian strata and may represent a refuge fauna after the Frasnian-Famennian mass extinction. He is also key member of the project "Late Paleozoic biotic radiation, extinction, and recovery (2000-2005, financed by Ministry of Science and Technology, China)".

Liao W. H. , 2003. Devonian biostratigraphy of Dushan, southern Guizhou and its coral extinction events. Acta Palaeontologica Sinica 42(3), 417-427. (in Chinese with English abstract)

Liao W. H. & Ruan Y. P. , 2003. Devonian Biostratigraphy of China. In: Zhang Wen-tang, Chen Peiji, Palmer A. R. , (eds.): Biostratigraphy of China, 237-279. Science Press, Beijing.

Rodriquez S. & **Liao W. H.** , 2003. A restudy of Cystophrentis Yu, 1931 (Rugosa) from the uppermost Fammenian (Strunian) of South China. Geobios 36: 407-419.

2. China University of Geosciences (Beijing) (by Jianqiang CHEN)

Jian qiang Chen and Xin yi He have specialized in rugose coral palaeotology, palaeobiogeography, evolution. Presently, they are engaged in the study of Late Ordovician and Silurian rugose coral taxonomic revision in general and species

level, original center and biogeographic affinity, Late Ordovician mass extinction of rugose corals, and Early Silurian (Llandovery) rugose coral recovery and radiation in the Yangtze region.

In the taxonomic revision of the Late Ordovician and Silurian rugose corals in the Yangtze region, altogether 125 genera comprising 32 families have been determined, with 16 genera comprising 3 families in Llandeilo-Lower Ashgill, 17 genera comprising 7 families in Middle Ashgill, 16 genera comprising 6 families in Upper Ashgill, 10 genera comprising 4 families in Upper Rhuddanian, 67 genera comprising 17 families in Aeronian, 20 genera comprising 9 families in Lower Telychian, 51 genera comprising 23 families in Middle and Upper Telychian, 12 genera comprising 6 families in Wenlock, 50 genera comprising 21 families in Ludlow-Pridoli, with a increasing of the number of families from Late Ordovician to Late Silurian, and with five evolutional peak stages including Middle Ashgill, Upper Ashgill, Aeronian, Middle and Upper Telychian, and Ludlow-Pridoli.

In the origin, disposal and biogeographic affinity of the Middle-Late Ordovician and the Llandovery rugose corals in the Yangtze region, among 125 genera of Rugosa， 30 genera first appeared in the Yangtze region and then dispersed to Europe and North America and other adjacent regions. We may regard that the Yangtze region may have been one of the origin centers for the Ordovician and Silurian rugose corals.

In Late Ordovician mass extinction of rugose corals in the Yangtze region, two phases of the latest Ordovician rugosan mass extinction are recognized. The first phase took place during the end of Rawtheyan Stage. The Late Ordovician(middle Ashgill) rugosan fauna of Lower Yangtze region contains 16 genera, among which 6 genera(37. 5%) became extinct in the end of Rawtheyan Stage. The second phase happened during the latest Hirnantian. The rugose coral fauna from the Guanyinqiao Beds of Upper Yangtze region contains 15 genera, among which 9 genera(60%) became extinct. The controlling factors of two extinction events are different. The global

sea-level decline caused by the Southern Hemisphere glaciations at the Late Ordovician and climatic deterioration are the main factors, which resulted in the first phase of rugosan mass extinction during the end of Rawtheyan. The second phase of the extinction again related to a rise of global temperature and a sharp rise of sea-level with oceanic water anoxia which caused the demise of the shallow, bottom-living and cool/cold water rugose coral fauna at the late Hirnantian(latest Ashgill) and the earliest Silurian. The two phases were coincided with the star of the Gondwana Supercontinental glaciation and its melting respectively.

In the Early Silurian(Llandovery) rugose coral recovery and radiation in the Upper Yangtze region, three macroevolutionary stages，including survival interval(early and middle Rhuddanian)，recovery interval(late Rhuddanian to early Aeronian)，and radiation interval(mid- to late Aeronian)are recognized. The survival interval with 6 genera is characterized by a few survival and Lazarus genera. The recovery interval has 15 genera with the small, solitary Streptelasmatida(10 genera: 67%). The radiation interval is a rapid generic increase of the Cystiphyllida(13 genera: 31%), the Streptelasmatida(19 genera: 45%) and the Columnariida (10 genera: 24%), with 14 new genera first appearing from the radiation interval. In addition, the radiation interval is of many colonial forms（12 genera: 29%） and occur the small reef composed of the rugose corals, tabulate corals and stromatoporoids. The debutantes taxa are subdivided into three kinds of the endemic-debutantes, the emigrant- debutantes and the immigrant-debutantes.

Publications (Chen and He) in 2003-2004:

Chen Jianqiang, He Xinyi, 2004. Early Silurian(Llandovery) rugose coral recovery and radiation in the Upper Yangtze region. In: Rong Jiayu, Fang Zhongjie(eds.), Biotic Mass Extinction and Recovery of the Paleozoic in South Chian. Hefei: Hefei Science and Technology Press, Chapt 2, Part 7, p. 185-205 (in Chinese with English abstract).

He X. Y. and Chen J. Q. , 2003. New information on Late Ordovician and Early Silurian rugose corals in northern Guizhou Province. Acta Palaeontologica Sinica, 42（2）：174-188, pl. I-III (in English with Chinese abstract).

He X. Y. and Chen J. Q. , 2004. Origin, disposal and biogeographic affinity of the Middle-Late Ordovician and the Llandovery rugose corals in the Yangtze region. Acta Palaeontologica Sinica, 43（2）：179-191 (in English with Chinese abstract).

He X. Y. and Chen J. Q. , 2004. Late Silurian rugose coral fauna from the Qujing district, east Yunnan. Acta Palaeontologica Sinica, 43（3）：303-324，pl. I-III (in Chinese with English abstract).

He X. Y. and Chen J. Q. , 2004. Late Ordovician mass extinction of rugose corals in the Yangtze region. In: Rong Jiayu, Fang Zhongjie(eds.), Biotic Mass Extinction and Recovery of the Paleozoic in South Chian. Hefei: Hefei Science and Technology Press, Chapt 2, Part 6, p. 167-183 (in Chinese with English abstract).

Other publications in China in 2003-2004

Chen M. , Wang J. , Tan F. W. and Du B. W. , 2003. The planar distribution and signigicance of the organic reefs in the Lower Cretaceous Nangshan Formation in the Coqen Basin, Xizang. Sedimentary Geology and Tethyan Geology 23(4): 68-70. (in Chinese)

Guo W. , Lin Y. D. and Liu G. h. , 2003. Early Permian Rugose coral assemblage and its geological significances in Xiwuqi of Inner Mongolia. Journal of Jilin university (Earth Science Edition) 33(4): 399-405. (in Chinese)

Lin Q. X. , Deng Z. L. and Wang G. C. , 2003. Study on Early-Middle Permian Reef and its sequence stratigraphy in Maerzheng Area, Eastern Kunlun. Earth Science - Journal of China University of Geosciences 28(6): 601-605. (in Chinese)

Liu X. H. , Liu Z. H. , Yang M. D. , Yang R. F. , Xiao Y. J. and Wang Y. , 2004.

A preliminary study on the Devonian Buzhai Reefs in Southern Guizhou. Chinese Journal of Geology 39(1): 92-97. (in Chinese)

Liu Z. H. , Liu X. H. , Yang M. D. and Yang R. F. , 2003. Palaeontology and palaeoecology characteristics of Devonlan reefs in Buzhai of Guizhou. Journal of Xiangtan Mineralogical Institute 18 (3): 29-32. (in Chinese)

Liu Z. H. , 2003. Communities, palaeogeography and reefs of Middle Permian Qixia period in Hunan. Chinese Journal of Geology, 38(2): 190-199. (in Chinese)

Ouyang R. , Jiao C. L. , Bai L. H. , Chang H. and Wang Y. C. , 2003. The distribution and features of reef in Tazhong Area of Tarim Basin, Northwest China. Petroleum exploration and development, 30(2): 33-36. (in Chinese)

Wu Y. S. , Fan J. S. and Jin Y. G. , 2003. Emergence of the Late Permian Changhsingian reefs at the end of the Permian. Acta Geologica Sinica 77(3): 289-296. (in Chinese)

Yang Z. Y. , Liu Z. H. , 2003. Inozoan, Major Reef frame-building organisms in Late Permian, Hunan. Oil & Gas Geology, 24(1), 70-74. (in Chinese)

Zhang Y. B. , Sun Y. L. , Liu J. B. and Han B. F. , 2004. A new species of Aphraxonia from the Upper Middle Devonian of the South Tianshan area, Xinjiang, China. Acta Palaeontologica Sinica 43(1): 118-123. (in Chinese)

Zhang Y. J. ， Cheng L. R. ， Zhang Y. C. , 2003. New material of Coral fossils in Lower Devonian, Daerdong Formation of Xainza, Tibet. Global Geoloy 22(4): 313-318. (in Chinese)

Japan (by T. Sugiyama)

Ezaki, Y. , Niikawa, I. , Nagai, K. and Sugiyama, T. are working on a project titled as: Taxonomic summary on the type specimens described by Japanese researchers during the 20th Century. This project financed by Japanese government until 2005, and is based on the type catalogue edited by Sugiyama, T. and Ezaki, Y. （2002）: Paleozoic and Mesozoic corals, In Ikeya, N. , Hirano, H.

and Ogasawara, K. (eds.), The database of Japanese fossil type specimens described during the 20th Century. Part 2, Palaeont. Soc. Japan, Special Papers, No. 40, p. 184-229.

They started visiting research at the university storage in order to find the existence of the type specimens, especially described before the World War II. Significant results already came out; 25 type specimens among the 29 species described by Yabe, H. and Hayasaka, I. (1915, 1916, 1920) with insufficient information such as without figures or without descriptions are found in the Tohoku University. *Cyathophyllum caespitosum var. breviseptata* Yabe and Hayasaka, *Cyathophyllum yanadai* Yabe and Hayasaka, Lophophyllum sinense Yabe and Hayasaka, *Clisiophyllum nodai* Yabe and Hayasaka, *Polyorophe*? dubia Yabe and Hayasaka, *Heterocaninia tholusitabulata* Yabe and Hayasaka are proved. They have a plan to make a monograph of these corals in near future.

Recent publications:

Hisayoshi IGO, Akira OKAYASU and Shuko ADACHI, 2003, Carboniferous rugose corals from the Arakigawa Formation in the Hida Gaien Belt, Gifu Prefecture, central Japan. Ann. Rep. , Inst. Geosci. , Univ. Tsukuba, no. 29, 51-56.

Hisayoshi IGO and Hisaharu IGO, 2004, A new Lower Carboniferous rugose coral, *Nemistium* from Mitsuzawa, Hinode Town of Nishitama County, west of Tokyo. Sci. Rept. Inst. Geosci. , Univ. Tsukuba, Sec. B, Geol. Sci. , vol. 25, 1-8, 4figs.

Xiang dong WANG, Tetsuo SUGIYAMA, and Feng ZHANG, 2004, Intraspecific variation in a new solitary fugose coral, *Commutia exoleta*, from the Lower Carboniferous of the Baoshan Block, Southwest China. Jour. Paleont. , 78 (1), 77-83.

Yoichi EZAKI, 2004, Paleoecological and Phylogenetic implications of asexual reproduction in the Permian scleractiniamorph *Numidiaphyllum*. Jour. Paleont. , 78 (1), 84-97.

Tadzhikistan (by N. Ospanova)

Leleshus V. L. 2003. Fife maxima of Biodiversity in the Paleozoic of Central

Asia [in Russian]. Paleontologiceskiy zhurnal 3, pp 13-20.
Fife maxima of biodiversity are identified in the Paleozoic of Central Asia: Late Cambrian, Caradoc-Ashgill, Early Devonian, Early Carboniferous, and late Early Permian. These maxima regularly alternated with the minima of biodiversity in the Early Ordovician, Early Silurian, Late Devonian, Middle Carboniferous, and Early Triassic.

Ospanova N. K. 2003. Nekotorye aspekty kolichestvenno-kachestvennoj izmenchivosti paleozoyskikh korallov [Some aspects of quantitative and qualitative variability of Palaeozoic corals]. Trudy Instituta geologii AN RT, New Series, 2, Dushanbe, Khumo (pp 35-44).

Ospanova N. K. 2004. Nekotorye posledstvija kolonizacii dna morskimi organizmami na granice dokembrija i kembrija [Some results of colonization by benthic organisms at the Precambrian / Cambrian boundary]. In: Biosfernye processy: paleontologija i stratigrafija [Biosphere processes: paleontology and stratigraphy] / Presentation Theses of the 50th session of the Paleontological Society of the Russian Academy of Sciences (April 2004, Sankt-Petersburg), Sankt-Petersburg (pp 96-97).

The United Kingdom (by S. Kershaw)

Markus Aretz & John Nudds continue their work on facies and faunas of Lower Carboniferous, and the following is their recent paper:
Aretz M. & Nudds J. [**submitted** to proceedings of Graz symposium] Palaeoecology of the late Visé an (Dinantian) coral-chaetetid biostrome at Little Asby Scar (Cumbria, Great Britain)
An Upper Visean (Dinantian) coral-chaetetid sponge biostrome is described from the basal bed of the Potts Beck Limestone at Little Asby Scar, northern England. The biostrome most probably represents the shallowest phase of a shallow-water succession. Chaetetid-dominated facies alternate with coral-dominated facies both horizontally and vertically. The number of organisms in situ is highest in the

chaetetid-dominated facies (~30%), whereas the coral-dominated facies consists mainly of *Siphonodendron* debris (~95%). These *Siphonodendron* debris layers provided the hard substrate for chaetetid sponge growth. Considerable vertical variations also include the distribution of syringoporid corals and heterocorals. The biostrome is classified as a polyspecific parabiostrome according to its composition and the abundance of intact organisms.
It displays a complex development with autochthonous growth of chaetetid sponges and few *Siphonodendron* colonies, and imported *Siphonodendron* debris. The biostrome lacks rigidity because the absence of encrusting organisms prevented development of a framework; superstratal growth seems not to be developed.

Ian Somerville: research is currently being carried out with Markus Aretz and Hans-Georg Herbig on Upper Visean rugose coral faunas from the Bricklieve Mountains, O'Donnell's Rock and Streedagh Point, NW Ireland. Analysis of the assemblages and composition of *Siphonodendron* biostromes is being investigated. Biostratigraphical ranges of taxa are being refined using microfossils (especially formanifera and algae) in collaboration with Pedro Cózar (Madrid).

Rachel Wood (Schlumberger Cambridge Research, and Dept. of Earth Sciences, University of Cambridge):
1. Palaeoecology of late Devonian reefs: I am continuing to work on the palaeoecology of the late Devonian reefs of the Canning Basin, Northwestern Australia. Fieldwork (with Tony Dickson and Claude-Alain Hasler (Cambridge), and Erwin Adams (MIT)) uses new differential GPS technologies to gain quantified and 3D geometries of the carbonate platform elements.
Wood, R. 2002. Palaeoecology of a post-extinction reef: Famennian (Late Devonian) of the Canning Basin, north-western Australia. Palaeontology 47 (2), 415-445.
2. Early metazoan reef palaeoecology: we describe a new Proterozoic fully biomineralized metazoan from the Omkyk Member (~ 549 Myr BP), of the northern Nama Group, Namibia. *Namapoikia reitoogensis* gen. et sp. nov. is up to

1 m in diameter, and bears a complex and robust biomineralized skeleton; it probably represents a cnidarian or poriferan. *Namapoikia* encrusts perpendicular to the walls of vertical synsedimentary fissures in microbial reefs. This finding implies that large, modular, metazoans with biologically controlled biomineralization appeared some 15 million years earlier than previously documented.

Wood, R. A. , Grotzinger, John P. , and Dickson, J. A. D. 2002. Proterozoic modular biomineralized metazoan from the Nama Group, Namibia. Science 296, 2383-2386.

Steve Kershaw continues work with Graham Young on internal growth bands in Palaeozoic corals and stromatoporoids, and a new classification is developed. The following is in press:

Young, G. and Kershaw, S. [in press]. Classification and controls of internal banding in Palaeozoic stromatoporoids and colonial corals. Palaeontology.

Work also progresses with Yue Li (Nanjing) on Ordovician and Silurian reefs in China; two papers published:

Li, Y. and Kershaw, S. 2003. Reef construction after extinction events of the latest Ordovician in the Yangtze Platform, South China. Facies 48, 269-284.

Li, Y. , Kershaw, S. and Mu, X. 2004. Ordovician reef systems and settings in south China before the Late Ordovician mass extinction. Palaeogeography, Palaeoclimatology, Palaeoecology 205, 235-254.

The United States of America

(by R. C. Baron-Szabo)

Frederick M. Bayer and Stephen D. Cairns have begun a collaboration to revise the deep-water octocoral fauna of the western Atlantic, essentially a detailed update of Deichmann's (1936) monograph of the same fauna. Large collections and extensive SEM of sclerite morphology are being employed. Thus far, the seven manuscripts (among those listed below) have been published or submitted for publication.

Publications:

Baron-Szabo, R. C. **2003**. Ontogenetical development in Dasmiopsis lamellicostatus (Reuss, 1854) (Scleractinian; Meandrinidae), a rare coral from the Upper Cretaceous Gosau-Group (Hofergraben, Austria). - Beitr ge zur Geologie des Salzkammerguts. In: Weidinger, J. T. , Lobitzer, H. & Spitzbart, I. : Gmundner Geo-Studien 2: 141-145; Gmunden.

Baron-Szabo R. C. , Casad ío S. & Parras A. , 2004. First shallow water scleractinian coral reef from the Danian, northern Patagonia, Argentina. Ameghiniana, Suplemento, 40 (4): 79R.

Hermatypic coral reefs have not been reported from the earliest Paleocene with a few exceptions of the unverified records (e. g. , Paris Basin). On the other hand azooxanthellate coral reefs from the early Paleocene of Greenland and Faxe, Denmark are well-documented. We describe the first Danian hermatypic coral reef from the Roca Formation at Lomita Baya, La Pampa, Argentina. The coral reef is primarily formed by the colonial taxa *Siderastrea* adkinsi (Wells, 1934) and Haimesastraea conferta Vaughan, 1900, and is distinctly dominated by *S. adkinsi* (62%-88% in shallowest parts of the reef, 82%-100% in adjacent areas). In the shallowest parts of the reef colonies of S. adkinsi are massive-folios or encrusting, ranging between a few centimeters to over 1 m in diameter. Specimens of *H. conferta* are distinctly smaller, generally knobby, and range between a few millimeters and 15 centimeters in diameter. Frequently, corals of the ' rolling stone type ' occur which, in addition to the presence of folios-encrusting morphotypes and the microfacies images, indicate that the reef developed in a highly wave-agitated environment of 0-10 m depth. Sponges and coralline algae played an important role in the reef frame. Other members of the coral reef community are the branching coral *Cladocora* cf. C. gracilis (d ' Orbigny, 1850), the solitary coral *Sideroseris durhami* Wells, 1945, the echinoid Micropsis desori (Cotteau, 1856), which is an inhabitant of hard substrates, the bivalves Acesta cf. A. latens (Feruglio, 1935), and *Venericardia iheringi* (Böhm,

1903), as well as several species of warm water gastropods. [short communication, full text]

Bayer, F. M. 2001 New species of *Calyptrophora* (Coelenterata: Octocorallia: Primnoidae) from the western part of the Atlantic Ocean. Proceedings of the Biological Society of Washington, 114 (2): 367-380, 6 figs.

Bayer, F. M. & S. D. Cairns (eds.). 2004. The unpublished plates for A. E. Verrill ' s unfinished report on the Alcyonaria of the A. Blake ' s expeditions. i-viii + 156 pls. , Dept. of Zoology, National Museum of Natural History, Washington, D. C.

[This publication deals with a very limited set (50) of the unpublished octocoral plates of A. E. Verrill. Verrill (1839-1926) was one of the most prolific and influential marine invertebrate zoologists of the late nineteenth and early twentieth centuries, having published over 350 papers in which he described over 1000 new species pertaining to almost every marine group. When he died at the age of 87 he left behind an unfinished monograph on the western Atlantic octocorals consisting of over 1000 pages of text and 156 meticulously drawn plates, much of the artwork done by Verrill ' s son Alpheus Hyatt Verrill. The text was lost, but over the years Dr. Frederick (Ted) Bayer, curator emeritus in the Department of Zoology, accumulated a unique, complete set of plates and a copy of Verrill ' s captions to those plates, in which Verrill alludes to the names of several hundred new taxa. Bayer painstakingly reassembled the plates, transcribed and annotated the captions, and then had 55 copies of the work published for general distribution. Thus, 78 years after his death, at least a part of Verrill ' s *magnum opus* can be used to help illustrate the deep-water western Atlantic octocorals, this work constituting the last publication of this prolific naturalist. The plates alone constitute an invaluable resource on the taxonomy of this group, and should be consulted by any serious student of the group.]

Cairns, S. D. 2001. Studies on western Atlantic Octocorallia (Coelenterata: Anthozoa). Part 1. The genus *Chrysogorgia.* Proceedings of the Biological

Society of Washington, 114 (3): 746-787, 18 pl.

Cairns, S. D. , & F. M. Bayer 2002. Studies on western Atlantic Octocorallia (Coelenterata: Anthozoa). Part 2: The genus *Callogorgia* Gray, 1858. Proceedings of the Biological Society of Washington, 115 (4): 840-867, 11 figs.

Cairns, S. D, & F. M. Bayer 2003. Studies on western Atlantic Octocorallia (Coelenterata: Anthozoa). Part 3: The genus Narella Gray, 1870. Proceedings of the Biological Society of Washington, 116 (2): 617-648, 14 figs.

Cairns, S. D, & F. M. Bayer 2003. Narella regularis (Duchassaing & Michelotti, 1860) (Coelenterata: Octocorallia: Primnoidae): proposed conservation of prevailing usage by a neotype. Bulletin of Zoological Nomenclature, 60 (4): 1-4, 1 fig. .

Cairns, S. D, & F. M. Bayer 2004 (in press). Studies on western Atlantic Octocorallia (Coelenterata: Anthozoa). Part 4: The genus *Paracalyptrophora* Kinoshita, 1908. Proceedings of the Biological Society of Washington, 117 (1):174-199. , 12 pls.

Cairns, S. D, & F. M. Bayer (in review). Studies on western Atlantic Octocorallia (Coelenterata: Anthozoa). Part 5: The genera *Plumarella* Gray, 1870; Acanthoprimnoa, n. gen. ; and Candidella Bayer, 1954.

Filkorn H. F. & Alor J. P. , 2004. A new Early Cretaceous coral (Anthozoa: Scleractinia; Dendrophylliina) and its evolutionary significance. Journal of Paleontology, 78 (3): 501-512.

Opresko, D. M. (in press for 2004). Revision of the Antipatharia (Cnidaria: Anthozoa). Part IV. Establishment of a new family, Aphanipathidae. Zoologische Mededelingen Leiden, 78 (00): 000-000, figs 1-15.

Living and fossil sponges research (by D. Janussen)

From the beginning of this year, there has been an intensive exchange of recent sponge publications at the Porifera Mailinglist. On the 11. 02. 04 Bernard E.

Picton (Zoology Department, Ulster Museum, Belfast, Northern Ireland) wrote:

"We've been having an off-list as well as on-list chat about this on-line references database. The best source will be Philippe Willenz's database which was used for Systema Porifera and has been much edited and expanded since. He hopes to put it on-line this spring. I think it will answer all our prayers, he has already compiled 16500 records (including some non-sponges, corals, calcification, etc.)."

This is a very optimistic perspective, and we hope to have online access to the data on current Porifera literature very soon. Unfortunately, it is not in accordance with copyright rules to distribute pdf-files directly from the database without first getting the permission of the publishers. But at least the current citations of sponge literature, including abstracts and key words, should be available online. A necessity is of course that all authors feed this database with any of his/her new publications on sponges and sponge-related topics.

Catalogue of recent sponge literature (published 2000 or later)

Below are the references to some of the recent sponge publications, their reprints (or pdf-files) can be requested from the authors. Those authors, of whom I have not the data, are kindly asked to send me as e-mail attachments citations of their most recent publications - in strict alphabetical order, rich text format, no numbering or other formatting please!, including abstracts if possible, so this can be easily edited and forwarded to "Fossil Cnidaria and Porifera".

Becerro, M. A., Thacker R., Turon X., Uriz M. J. & Paul V. (2003). Biogeography of sponges chemical ecology: comparisons of tropical and temperate defenses. Oecologia 135, 91-101.

Becerro, M. A, Turon, X, Uriz, M. J. & Templado, J. 2003. Can a sponge feeder be an herbivore ? *Tylodina perversa* (Gastropoda) feeding on *Aplysina aerophoba* (Demospongiae). Biol. J. Linn. Soc., 79: 429-438.

Bell, J. J. (2002). Regeneration rates of a temperate demosponge: the importance of water flow rate. Journal of the Marine Biological Association of the United Kingdom 82, 169-170.

Bell, J. J. (2002). The sponge community in a temperate sea cave: density, diversity and richness. Marine Ecology 23 (4) 297-311

Bell, J. J. (2002). The influence of flow rate, depth and surface inclination on the density and distribution of temperate anthozoa. Journal of the Marine Biological Association of the United Kingdom 81, 883-884.

Bell, J. J. (2003). Seasonal fall out of sessile macro-fauna from submarine cliffs: quantification, causes and implications. Journal of the Marine Biological Association of the United Kingdom 83, 1199-1208.

Bell, J. J. (2003). The density and prevalence of sponge species in a temperate sea cave at Lough Hyne Marine Nature Reserve, Co. Cork, Ireland. Irish Naturalists Journal 27 (7), 249-265.

Bell, J. J. & Barnes, D. K. A. (2002). Branching dynamics of two species of arborescent demosponge: the effect of flow regime and bathymetry. Journal of the Marine Biological Association of the United Kingdom 82, 279-294.

Bell J. J. & Barnes, D. K. A. (2002). Modelling sponges species diversity using a morphological predictor: a tropical test of temperate model. Journal of Nature Conservation 10, 41-50.

Bell, J. J. & Barnes, D. K. A. (2002). Unattached sponges: density, distribution and decline. Sarsia 87, 110-118.

Bell, J. J. & Barnes, D. K. A (2003). Differentiation between effects of environment and age in assemblages: an example using Porifera. Biological Bulletin 204, 144-159

Bell, J. J. & Barnes, D. K. A. (2003). The importance of competitor identity, morphology and ranking methodology to outcomes in interference competition: An example of sponges. Marine Biology 143, 415-426.

Bell, J. J. , Barnes, D. K. A. & Turner, J. R (2002). The importance of micro and macro morphological variation in adaptation of a sublittoral demosponge to current extremes. Marine Biology 140, 75-81.

Bonse, D. , Janussen, D. , Meixner, M. & Eckert, C. 2003: The reconstruction of paleoecological development in Lake Baikal based on recent and fossil sponge associations and their evolutionary development. Berliner Pal?obiologische Abhandlungen 2, 15-16.

Brückner, A. ; Janussen, D. & Schneider, S. (2003). Eine neue Poriferen-Fauna aus dem Septarienton (Oligozän, Rupelium) von Bad Freienwalde (NE-Deutschland) und der erste fossil erhaltene Vertreter der nicht-rigiden Hexactinelliden-Gattung Asconema. Paläontologische Zeitschrift 77 (2), 263-280.

De Caralt, S. , Agell, G & Uriz, M. J. (2003). Long-term culture of sponge explants: conditions enhancing sponge growth and bioactivity. Biomolecular Engineering 20, (2), 78-79

Cebrian E. , Martí R. , Uriz M. J. & Turon X. (2003). Sublethal effects of contamination on the Mediterranean sponge Crambe crambe: metal accumulation and biological responses. Mar. Pol. Bull. 46, 1273-1284.

Corriero G. , Gherardi M. , Giangrande A. , Longo C. , Mercurio M. , Musco L. , C. Nonnis Marzano (in press). Inventory and distribution of hard bottom fauna from the Marine Protected Area of Porto Cesareo (Ionian Sea): Porifera and Polychaeta. Ital. J. Zool.

Corriero G. , Longo C. , Mercurio M. , Nonnis Marzano C. , Lembo G. , M. T. Spedicato (submitted). Rearing performances of *Spongia officinalis* on suspended ropes off Southern Italian coast (Central Mediterranean Sea). Aquaculture.

Corriero G. , Scalera Liaci L. , Ruggiero D. & Pansini M. (2000). Sponge community from a semisubmerged mediterranean cave. P. S. Z. N. I Mar. Ecol. , 21 (1): 85-96.

Davis A. R. , Fyfe S. K. , Turon X. & Uriz M. J. (2003). Size matters sometimes: wall height and the structure of subtidal benthic invertebrate assemblages in south-eastern Australia and Mediterranean Spain. Journal of Biogeography 30, 1-11.

Duran S. , Giribet G. , Turon X. (2004). Phylogeographic history of the sponge *Crambe crambe* (Porifera, Poecilosclerida): range expansion and recent invasion

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Stromatoporoids and related organisms (by C. W. Stearn)

Bolshakova L. N. , 2003. Stromatoporoidei (pp 18-52, pls. 1-12) in L. N. Bolshakova, O. B. Bondarenko, Ch. Minzhin, L. M. Ultina, T. T. Sharkova (ed. A. Pozanov), Korally i stromatoporoidei: Ordovik-devon, Paleontologiya Mongolii, 285 pp, Nauka, Moscow.
[CWS:] This monograph includes an introductory section by several authors on the stratigraphy of the area. The general material on stromatoporoids by Bolshakova includes sections on Morphology, Methods of Study, Systematic

Position, Paleoecology, Stratigraphic Occurrence, and Paleobiogeography. In the Systematic Section are descriptions of 25 genera and the plates illustrate 24 species of stromatoporoids.

Fluegel E. and Singh I. B. , 2003. Stromatoporoid-grade and other sponge fossils from the upper Krol Formation of the Lesser Himalaya (India): implications for the biotic evolution around the Precambrian-Cambrian boundary interval. Facies 49, pp 351-372.

Kazmierczak Jozef, 2003. Grupa Stromatolity stromatoporoidowe. In: Budowa Geologiczna Polski. III. Atlas skamienialosci przewodnich i charakterystycznych, part 1b, Dewon (ed. L. Malinowska), pp 690-707, pls 390-403. Panstwowy Instytut Geologiczny, Warszawa.
[CWS:] This section of the Polish Atlas of Index and Characteristic Fossils is a condensation of the 1971 monograph of Kazmierczaks on Stromatoporoids from the Holy Cross Mountains (Palaeontologia Polonica 26). Thirty-nine species are described briefly and illustrated with rearranged photomicrographs from the 1971 publication. Generic discussions are not included. Ten species have been dropped from the faunal list. In an introduction of two and a half pages the hypothesis that the stromatoporoids should be placed in the Cyanophyta is adopted. [In Polish, see also bibliographic note in Fossil Cnidaria & Porifera 32. 2, p. 56]

Luczynski P. , 2003. Stromatoporoid morphology in the Devonian of Holy Cross Mountains, Poland, and its palaeoenvironmental significance. Acta Geologica Polonica 53 (1), pp 19-27.

Miller C. E. , 2003. Stromatoporoidea: an overview. p. 24-29 in Way, J. H. et al. (eds.) 68th Annual Field Conference of Pennsylvanian Geologists Guidebook. Altoona, PA.
[CWS:] A general treatment of Paleozoic stromatoporoids for participants in a field trip to the Keyser Limestone in central Pennsylvania. [see below]

Miller C. E. , 2003. Paleoecology of the Keyser Limestone and its stromatoporoids in central Pennsylvania. p. 30-41 in Way, J. H. et al. (eds.) 68th Annual Field Conference of Pennsylvanian Geologists Guidebook. Altoona, PA.
[CWS:] This paper reviews the lithofacies, stratigraphy, and paleoenvironments of the Keyser Formation (Silurian, Pridoli) and describes the place of stromatoporoids in various lithofacies. The paleoecological roles of stromatoporoids are described with reference to patch reefs exposed at Altoona (Eldorado quarry), the Altoona Bible Church, near Jersey Shore, and at Mustoe (Virginia). The only species of stromatoporoid mentioned is "Stromatopora" constellata.

Racki G. and Sobstel M. , 2004. Very large stromatoporoid indicating Early Frasnian reef core (Holy Cross Mts. , Poland). Geological Quarterly 48, 83-88.

Riding R. , 2002. Structure and composition of organic reefs and carbonate reef mounds: concepts and categories. Earth Science Reviews 58, 163-231.
[CWS:] This extensive paper reviews the classification of organic reefs and the principles on which various classifications rest. Although it is not primarily about stromatoporoids, these fossils, among many others, are mentioned in many places and illustrated in figures 23, 24, 25 and 34. References to the roles of stromatoporoids in reefs can be found on pages 166, 167, 180, 191, 193, 197, 200, 201, and 209.

Riding R. , 2004. Solenopora is a chaetetid sponge, not an alga. Palaeontology 47 (1), 117-122.

Rigby J. K. (coordinating author), Finks R. M. , and Reid R. F. H. , 2003. Porifera (Part E, Volume 2, Revised), Treatise on Invertebrate Paleontology, (R. L. Kaesler, ed.), Geological Society of America and University of Kansas, Boulder and Lawrence, 349 pp.
[CWS:] Although not referring specifically to the stromatoporoids, this volume

contains a wealth of general information about sponges (particularly hexactinellids and demosponges) such as: reproduction, physiology, functional morphology, variability, ecology, paleoecology, geographic and stratigraphic distribution, and evolution.

Rosenheim B. E. , Swart, P. K. , Thorrold, Willenz P. , Berry L. , and Latkoczy C. , 2004. High resolution Sr/Ca records in sclerosponges calibrated to temperature in situ. Geology 32, 145-148.

Stanley, G. D. , 2002. Biotic changes in early Mesozoic reefs in Triassic to Jurassic time. (Abstract). Geological Society of America, Abstracts with Programs 34 (6), 66.

Sepkoski J. J. , 2002. A compendium of fossil marine animal genera. (edited by D. Jablonski and M. Foote) Bulletins of American Paleontology 363, 1-560.
[CWS:] Lists in alphabetical order of Paleozoic stromatoporoid genera showing first and last appearances and a reference number are on pages 37 and 38. Most of the ranges are given to stage precision. Post-Devonian "stromatoporoids" are listed on pages 38 and 39 as in the poriferan order Axinellida. The bibliography contains over 1100 references. In the appendix on "Linnean Classification of Higher Taxa" the order Stromatoporoidea is placed within the class Demospongia.

Webby B. D. , 2002. Patterns of Ordovician reef development. (In) Phanerozoic Reef Patterns, SEPM Special Publication 72, 129-179.
[CWS:] This is an extensive survey of Ordovician reef occurrences on a world-wide scale. The section on "Reef Biota" includes discussion of various stromatoporoid faunas and mentions some of the common labechiid genera. The concluding section discusses patterns and controls of reef distribution such as tectonic setting, climate, sea level, and circulation.

Webby B. D. , 2004. Stromatoporoids. (In) B. D. Webby, F. Paris, M. I. Droser

and I. G. Percival (eds.), The Great Ordovician Biodiversification Event, pp 112-118. Columbia Univesity Press, New York.
[CWS:] The orders Labechiida (6 familes, 22 genera) and Clathrodictyida (2 familes, 4 genera) represent the class Stromatoporoidea of calcified sponges in the Ordovician. One stromatoporoid community is associated with the reef facies; another is characterized by genera of columnar growth and is presumed to have lived in deeper water on carbonate ramps. All Ordovician stromatoporoid communities plot into paleolatitudes between 30 degrees north and thirty degrees south. The pulchrilaminids comprise a family of doubtful affinity of large framebuilders that occur in the late Early Ordovician of North and South America. The rest of the labechiids first diversified in late Middle Ordovician and secondly in Caradoc time. The initial radiation of the clathrodictyids occurred in mid to late Caradoc with the appearance of Ecclimadictyon. Ordovician stromatoporoid diversity peaked in early to mid Ashgill and fell abruptly with the Hirnantian glaciations. Diversity curves for genera and species are presented as "normalized" and "range through" versions. The latter shows a steady increase in generic diversity from late Middle Ordovician to mid Late Ordovician and a sharp decline in the Hirnantian. The sensitivity of labechiids to oceanic cooling is discussed in the light of the hypotheses of Stearn (1987) and Nestor and Stock (2001). The relationship of the diversity trends to sea level changes is also considered.

Wood R. , 2004. Palaeoecology of a post-extinction reef: Famennian (Late Devonian) of the Canning Basin, north-western Australia. Palaeontology 47 (2), 415-445.
[CWS:] this paper contains more about stromatoporoids than this abstract suggests.

Bibliography

Corals in general (by Kl. Oekentorp)

Avlar H. , 1991. Katalog der Typen und Belegstücke zur Paläozoologie im Geologisch-Paläontologischen Institut und Museum der Westfälischen Wilhelms-Universität Münster. I. Teil: Invertebrata- Coelenterata/Archaeocyatha; Sammlung der Forschungsstelle für Korallenpaläe ozoologie. Veröffentlichungen des Geologisch-Paläontologischen Museums 5, 141 pp. ; Münster.

[this catalogue has been published for the 6th International Symposium on Fossil Cnidaria and Porifera, Münster 1991, and contains data on all the specimens and thin sections held at the Forschungsstelle]

Fontaine H. , Salyapongse S. & Suteethorn V. , 2003. Glimpses into fossil assemblages of Thailand: Coral perspectives. -Bulletin of Siam Society of Natural History 51 (1): 37-67.

Fossil corals are widespread in Thailand. They belong to many geological intervals, from Ordovician to Quarternary. They have been studied actively during the last 20 years. They are better known, even though some research still needs to be carried out; for instances, Triassic corals, which occur in abundance at many localities of Thailand, remain inadequately known. Carboniferous, Permian and Triassic corals are widespread in Thailand. Devonian and Jurassic corals are in abundance in restricted areas. Ordovician and Silurian corals are rare and remain poorly known. Cretaceous corals are completely absent. In Thailand, the study of

corals is the study of long history. One can observe living corals as well as many groups of fossil corals. Corals provide important information on past environments and help to reconstruct paleogeography; they also provide information on the ages of the rocks in which they are included. In this paper, two Devonian localities are mentioned for the first time; they were discovered in January 2002. [Original abstract]

Karlson R. H. , Cornell H. V. & Hughes T. P. , 2004. Coral communities are regionally enriched along an oceanic biodiversity gradient. -Nature, 429.

Ecological communities are influenced by processes operating at multiple scales. Thus, a better understanding of how broad- as well as local-scale processes affect species diversity and richness is increasingly becoming a central focus in modern community ecology. Here, in a study of unprecedented geographical scope, we show significant regional and local variation in the species richness of coral assemblages across an oceanic biodiversity gradient. The gradient that we sampled extends 10. 000 km eastwards from the world 's richest coral biodiversity hotspot in the central Indo-Pacific. Local richness and the size of regional species pools decline significantly across 15 islands spanning the gradient. In addition, richness declines across three adjacent habitats (reef slopes, crests and flats). In each habitat, a highly consistent linear relationship between local and regional species richness indicates strong regional enrichment. Thus, even on the most diverse coral reefs in the world, local coral assemblages are profoundly affected by regional-scale processes. Understanding these historical and biogeographical influences is essential for the effective management and preservation of these endangered communities.

Sorauf J. E. , 2004. Permian corals of Timor (Rugosa and Tabulata): history of collection study. Alcheringia 28, 157-183, 4 figs, 6 tabs.
The modern history of collection and study of corals in the Perminan strata of

Timor began in 1911, with a German expedition (J. Wanner, leader) and a Dutch expedition (H. Molengraaff, leader) to collect Permian and Triassic fossils in the colony of Netherlands Timor, and with a survey by the Swiss geologist F. Weber the same year in Potuguese Timor, the eastern portion of the island. Later expeditions led by Jonker (1916) and Brouwer (1937), both of the Netherlands, greatly increased already huge collections of fossils and additionally, understanding of the island ' s geology. Monographic studies of these coral collections by Gerth (1921), Koker (1924), Schindewolf (1942), Hehenwarter (1951) and Schoupp é & Stacul (1955, 1959) have much enhanced the systematic value of these fossil corals, both Rugosa and Tabulata. Locality information and maps containing collecting localities are somewhat scattered (Wanner 1931, Burck 1923, Marez Oyens 1940, Van Bemmelen 1949), but are summarized here. A list of all valid species names (109 Rugosa, 25 Tabulata) is appended to this paper, with type localities and horizon. Serious problems of nomenclature are avoided in this paper by accepting genus names used in Hill (1981), modified by later systematic studies, such as that of Fedorowski (1986), but some unknown number of names in the list of species are to be synonymized, especially since 31 of them are based on a single specimen (e. g. Niermann 1975). The biostratigraphy of these faunas is uncertain, in great part due to the greatest number of corals having been collected from a tectonic m élange sequence in the Baun to Basleo structural region, and additionally because of the purchase of huge numbers of fossils from the indigenous people of Timor, with accompanying uncertainties regarding locality and horizon data. The coral fauna of Permian age from Timor needs serious restudy to insure its stratigraphic and palaeontologic value, but future study will require new field collection of specimens from relatively complete stratigraphic sequences in the northern ' Fatu ' belt of outcrops. The huge numbers of individuals of some coral species provide great opportunities for understanding population structure in the faunas. [original abstract]

Rugosa(by X. D. Wang, Kl. Oekentorp and T. Wrzolek)

Aretz M. and Herbig H. G. , 2003. Contribution of rugose corals to late Visean and Serpukhovian bioconstructions in the Montagne Noire; southern France. In: Permo-Carboniferous carbonate platforms and reefs, Special Publication-Society for Sedimentary Geology 78: 119-132.

Coral-bearing bioconstructions are described for the first time from upper Lower Carboniferous (Upper Mississippian) shallow-water limestone olistoliths of the southern Montagne Noire (Mont Peyroux Nappe), southern France. Microbial-induced wackestones and microbial boundstones dominate major parts of the Brigantian Roque Redonde Formation and Serpukhovian Roc de Murviel Formation, which follows on top of a paleokarst. Further subtidal facies are intercalated. The short-lived bioconstructions consist of thin monospecific and polyspecific coral biostromes, coral bioherms (patch reefs) growing in high-energy turbulent environments, and a single example of a large shallow-water microbial buildup that formed below fair-weather wave base in dimmed light. The contribution of rugose corals to the bioconstructions varies from active framebuilding in the biostromes and bioherms to passive dwelling of sparse fauna in the microbial buildup. Microbial structures are of special importance within polyspecific biostromes and patch reefs. In a delicate balanced system they are responsible for growth or suffocation of the coral-dominated bioconstructions. That co-occurrence of coral boundstones and microbial boundstones appears to be a widespread characteristic of small reefs in Late Visean and Early Serpukhovian time. Factors limiting the growth of the bioconstructions in southern France include rapid sea-level variations, tectonic instability of the shelf, and intrinsic paleobiological features of the rugose corals, like their fragility and inability to encrust mobile substrates. Comparable upper Lower Carboniferous coral-bearing bioconstructions of the Paleotethys realm and the epeiric seas of northwestern Europe are discussed. (Original abstract)

Berkowski B. , 2004. Monospecific rugosan assemblage from the Emsian hydrothermal vents of Morocco. Acta Palaeontologica Polonica 49, (1), 75-84.

Unique monospecific assemblages of small, solitary, undissepimented rugose corals are described from the Devonian deep-sea hydrothermal venting systems of the Hamar Laghdad (Anti-Atlas, Morocco). Assemblages of numerous rugosans (coral meadows) have been found around the outlets of venting channels irregularly forked within the Emsian mud mounds. Majority of rugose corals, which settled around vents, reveal a bizarre pattern of growth called here "calice-in-calice". The phenomenon of "calice-in-calice" growth is related to selective survival of coral larvae i. e. it is postulated that the larvae, which settle within the calices of extinct individuals were more successful in their development. They probably use empty calices as shelters against the physical (hot or poisoning fluids) or biological (predators) factors. The presence of numerous carapaces of ostracods within the calices of extinct rugosans suggests a strong trophic relation between corals and ostracods, which lived around hydrothermal vents. New genus and species Hamarophyllum belkai is proposed.

Chen J. Q. and He X. Y. , 2004. Early Silurian (Llandovery) rugose coral recovery and radiation in the Upper Yangtze region. In: Rong Jiayu, Fang Zhongjie (eds.), Biotic Mass Extinction and Recovery of the Paleozoic in South Chian. Hefei: Hefei Science and Technology Press, Chapt 2, Part 7, p. 185-205 (in Chinese with English abstract).

Upper Yangtze region contains many complete sections through the Upper Ordovician and Lower Silurian（Llandovery）. Three macroevolutionary stages，including survival interval(early and middle Rhuddanian)， recovery interval(late Rhuddanian to early Aeronian)，and radiation interval(mid- to late Aeronian)，are recognized based on rugose coral data, with the redefinition and modification of some genera and statistical analysis of the range and distribution of the rugosan genera, including rugose coral 44 genera, assigned to 3 orders and 13 families

from the Lower Silurian (Llandovery) of the Upper Yangtze region. It is discussed that the feature, pattern, and control factors of the macroevolutionary stages and their fauna. The rugose coral fauna of the survival interval are composed of 6 genera, assigned to 2 orders and 3 families, and are characterized by a few survival and Lazarus genera. During the recovery interval the rugose coral fauna are possessed of 15 genera from 3 orders and 8 families, and are dominated numerically by the small, solitary Streptelasmatida(10 genera: 67%), with first appearing abundance debutantes taxi and endemic forms. Forty-two rugose coral genera are recorded from the radiation interval. Some genera in the radiation interval extended up from the recovery interval, whereas many genera occur first in the form of the debutantes taxa and radiation taxa. One of the most striking differences between the recovery and radiation interval is a rapid generic increase of the Cystiphyllida(13 genera: 31%), the Streptelasmatida(19 genera: 45%) and the Columnariida (10 genera: 24%), with 14 new genera first appearing from the radiation interval. In addition, the radiation interval is of many colonial forms (12 genera: 29%) and occur the small reef composed of the rugose corals, tabulate corals and stromatoporoids. It should be emphasized that typical Silurian rugose corals are known to occur during the recovery interval and the radiation interval in Yangtze region. They include representatives of the crisis progenitor taxa, debutantes taxa and radiation taxa. It is recognized that the beginning of the 3 orders(Cystiphyllida, Streptelasmatida, Columnariida), with differential recovery and radiation rates for each group, were different respectively. In the recovery interval and radiation interval, the beginning of Cystiphyllida and Streptelasmatida were earlier than the order Columnariida. It is indicated that the conditions of the ecological environments or ecosystem during the Early Silurian were more adaptable for diversity of the Cystiphyllida and Streptelasmatida which were more primitive rugose corals than the Columnariida which was more advanced group with rapidly development after Silurian. The debutantes taxa are subdivided into three kinds of the endemic-debutantes, the emigrant- debutantes and the immigrant-debutantes. (Original abstract)

Fan Y. N. , Yu X. G. , He Y. X. , Pan Y. T. , Li X. , Wang F. Y. , Tang D. J. , Chen S. J. , Zhao P. R. & Liu J. J. , 2003. The Late Palaeozoic Rugose corals of Xizang (Tibet) and adjacent regions and their Palaeogiogeography. -Earth, Series of Geoscience: 679 pp. , 73 figs. , 36 tabs. , 73 pls. Hunan science & technology press.

This monograph includes the following 8 part (besides the introduction)

1. Stratigraphical regionalization and description of section.
2. The sequences and assemblage zones of the Rugose corals.
3. Characteristics and distinction of Rugose Corals in the Palaeotethysan Neritic facies、Slope facies and Gondwanan facies.
4. Composition of carbon and oxygen isotopes of corals skeleton in Palaeotethysan neritic, Slope, and Gondwanan facies.
5. Biogeographical Regions of the rugose corals.

According to the characters of assemblage and distribution of the much rugose corals in Late Palaeozoic, the authors have divided into the China biogeographical Region of the Boreal Realm、the Palaethethysan Realm and the Gondwanan Realm in China.

a. The China Region of the Boreal biogeographical Realm: The rugose corals dominated North America in type, most of them are solitary corals of no dissepiments.

b. The China Region of the Palaeotethysan biogeographical Realm: It occupied the richly solitary and compound corals, with dissepiments, and some reef building corals appear usually in this Realm.

c. The China Region of the Gondwanan biogeographical Realm: The rugose corals are small solitary, their dissepiments absent. But during the Late Middle Permian (Maokouan age), the Indian Plate gradually shifted northwards into the Palaeotethysan Realm where sediments were received, when the rugose coral fauna, adapted to the warm water environment, is predominated by the Suborder Wentelellina.

6. The affinities of some rugose corals.

The authors have made a systematic research on the affinity of some rugose

coral genera and have solved the problems of their origin, the evolution and the interrelationship of some rugose corals genera, revising their taxonomic position.

7. Restatement on the classification of Wentelellina

8. Description of corals

The monograph describes totally 38 family(3 new family), 149 genera (12 new genera and 3 new subgenera), 338 species [64 new species and 2 subspecies(1 new)] and 6 non-determinable species.

Among of them, 12 new genera, including 2 new genera are the small solitary without dissepiments being adapted to the cold-water environment by the sea of the north margin of the Gondwanaland, and 5 genera, including 1 new genus, belong to the slope facies of the Palaeotethys. The 73 Paltes of fossils and 53 text-figures show the affinity and the characters of growth in various stages of some genera and species. [Original part of introduction]

Fedorowski J. , 2003. Some remarks on diagenesis of rugose coral skeletons. Geologos 6, pp 89-109, pls. 1,2.

Rugose coral microstructure exhibits striking similarity to that in the Scleractinia. The main difference lies in the mineral composition: calcitic in the former and aragonitic in the latter. Calcitic skeletons of the Rugosa are commonly better preserved than those in the Scleractinia, and therefore some of them have been interpreted as unaltered, a position rejected in this paper. The dual nature of septa, which commonly consist of a primary trabecular septum and secondary fibrous sheets, results in differently expressed diagenetic alterations in comparison to other structural elements. It bas been postulated that both early and advanced diagenesis may, in some circumstances, be distinguished in the Rugosa. In most instances the early diagenetic features were destroyed by the post-burial alterations. Replacement and re-crystallization are the most important processes among the advanced chemical alterations. Both may either facilitate the recognition of original macro- and mi cro-structures or obscure them. Surface replacement by silica promotes perfect preservation of shape and inner

morphology, whereas pervasive replacement may destroy both. Selected replacement by hematite may help in exposing the trabecular microstructure of septa, whereas deep replacement may destroy the entire morphology. Physical alterations, such as crushing and flattening of skeletons are always destructive. They result from compaction, and their scale depends on skeletal morphology and on the relationship between the rate of infilling of intra-skeletal spaces and the accumulation of surrounding sediment. Pre-burial events, such as overgrowth and penetration by borrowing organisms, their holdfasts or roots may aid in the recognition of early diagenesis, but may also lead to substantial pre- or post-burial skeletal alteration, resulting sometimes in total destruction. This depends mostly on the pH of pore fluids.

Fedorowski J. , 2004. Considerations on most Rugosa and the Dividocorallia from de Groot ' s (1963) collection. Scripta Geologica 127, pp 71-311, 1 fig. , 54 pls [Leiden, May 2004].

Rugose corals reinvestigated herein constitute the main part of the collection described by de Groot (1963). The taxonomy proposed herein differs in several instances from that accepted originally by de Groot. Some changes, such as *Petalaxis* for *Lithostrotionella* and *Calophyllum* instead of *Polycoelia*, were already introduced in de Groot ' s unpublished catalogue. Others were introduced in order to match the recent advances in recent rugose corals systematics. Most systematic changes were based on new microstructural, diagenetic and hystero-ontogenetic studies. These are described in detail for individual species and briefly discussed in the concluding considerations. Trabecular microstructure of septa and its diagenetic alteration was documented for most species. Presence of two kinds of intercorallite walls (partition and dividing walls) was documented on the basis of their difference in microstructure. This was especially important for the genus *Petalaxis*, allowing proof of a distinction between species representing its nominative subgenus and that distinguished by de Groot as *Hillia*.

A new name *Degrootia* was proposed for *Hillia*, which is preoccupied by a lepidopteran.

Two genera, one new (*Arctocorallium* gen. nov.), represented by two species, were transferred to the Calyxcorallia (Dividocorallia), the order and subclass not distinguished by de Groot. Both those species were investigated and documented in particular detail, especially their hystero-ontogeny. The restudied material allowed proof of a distinction between the Calyxcorallia and the Rugosa in the insertion of major septa. Also, an uncertain status of minor-like septa that may replace the major septa was demonstrated. Both those determinations are based on the hystero-ontogeny.

Galle, A. & Ficner, F. , 2004. Middle Devonian *Calceola sandalina* (Linnaeus, 1771) (Anthozoa, Rugosa) from Moravia (Czech Republic): aspects of functional morphology, gerontic growth patterns, and epibionts. -Geodiversitas 26 (1): 17-31; Paris.

Middle Devonian (lower Givetian) *Calceola sandalina* (Linnaeus, 1771) from Celechovice Limestone, Moravia, Czech Republic, displays sharply differing ontogenetic stages. Width of ventral side and size/volume of calice steadily increases in juvenile and adult stages but decreases in some specimens in final stages of life: we consider these reductive late stages to be gerontic characters. " Ventral " side of juvenile specimens is flat and straight while in adults this side becomes convex. We suggest that opening of operculum and shifting part of polyp body mass forward would shift centre of gravity so that calicinal part of adult coral could rock down to sea-bottom. Closing operculum would elevate calice above bottom. Rocking movements could help to free coral from sediment. Operculum positioning could move coral and keep it in optimum feeding position. Single specimens show predation injury: almost half of the " ventral " side is missing between counter septum and corallite angle but has healed within calice. [Original abstract]

Glinski, A. , 2001. *Tryplasma* (Anthozoa, Rugosa) im Mitteldevon der Eifel

(Rheinisches Schiefergebirge, Deutschland). - Senckenbergiana lethaea 81 (1): 71-89, 3 pls. ; Frankfurt am Main.

The genus *Tryplasma* Lonsdale 1845 with the species *Tryplasma rohrensis* n. sp. (family Tryplasmatidae Etheridge 1907) has been recorded from the middle and western European Middle Devonian for the first time. *Tryplasma* is widely distributed in the lowermost part of the coral-rich Niederehe Subformation (Eifelian, Ahrdorf Formation) of the Eifel Mountains. From investigation of the trabecular microstructure of the new species *Tryplasma rohrensis* in view of its taxonomic value and related terminology, the hitherto preferred idea of "rhabdacanths" sensu Hill (1936) cannot be accepted and is instead contrasted with the concept of "Prim rseptum" of some earlier authors. Microscopic analysis revealed identical acanthine characteristics in a species of the tabulate genus *Syringocystis* Deng 1966, thus suggesting a basic revision and reinterpretation of its systematic position. Syringocystis can clearly be compared with Tryplasma and so possible classified as a rugose coral. [Original abstract]

Guo W. , Lin Y. D. and Liu G. h. , 2003. Early Permian Rugose coral assemblage and its geological significances in Xiwuqi of Inner Mongolia. Journal of Jilin university (Earth Science Edition) 33(4): 399-405. (in Chinese with English abstract)

Based on biostratigraphical discussion, the paper gives a detailed description to the rugose fauna of the early-Permian, including 7 new species. Two coral assemblages are divided: *Lytvolasma-Cyathocarinia* and *Lytvolasma-Caninophyllum-Pseudopolythecalis*. The first assemblage is mainly made up of minitype, monocase. Septa and their ektecines are all thickeded; the second assemblages exhibits mixed fauna including colony and monocase corals. The paper also puts forward the overlapped type and mixed type of the mixed fauna in the area, and points out that the appearance of the mixed fauna in this area is consistent with the general decreased temperature from late Carboniderous to early Permian, and also

reflects climate changes from warm to cold, then to warm again. The study also reveals that the nature of the Paleo-Asian oceanic crust had essentially changed a little before the early Permian; it was shallow sea in an arch-island environment, not an open sea. (Original abstract)

He X. Y. and Chen J. Q. , 2003. New Information on Late Ordovician and Early Silurian Rugose corals in Northern Guizhou Province. Acta Palaeontologica Sinica, 42(2): 174-188. (in Chinese with English abstract)

7 genera of rugose corals are reported from the middle LIandovery in northern Guizhuo Province of China for the first time. They are *Cantrillia*, *Neocantrillia*, *Prototryplasma*, *Pycnostylus*, *Dalmanophyllum*?, *Rhegmaphyllum* and *Schlotheimophllum.* In addition, two species(*Grewingkia* cf. *bilateralis*(Neurman) and *Brachyelasma* cf. *medioseptatum*(Neurman)) collected from the late Ashgill Guanyinqiao Beds in the Shiqian County of northern Guizhou Province, and one species(Crassilasma sp.) from the early Ashgill Jiancaogou(Jiantsaoshou) Formation in the same area are described. These data enrich further the content of the Late Ordovician and Early Silurian rugose coral fauna in Yangtze region, and are considerably significant for study on origin, evolution and disperse of some Early Paleozoic rugose corals. Altogerther 18 species assigned to 13 genera are described. Among them 6 species are new. They are *Crassilasma fenggangense* sp. nov., *C. crebrumseptatum* sp. nov., *Dinophyllum insolitum* sp. nov. , *Neocantrillia* sp. nov. , *Prototryplasma guizhouense* sp. nov. and *Schlotheimophyllum regeneranum* sp. nov. (Original abstract)

He X. Y. and Chen J. Q. , 2004. Origin, disposal and biogeographic affinity of the Middle-Late Ordovician and the Llandovery rugose corals in the Yangtze region. Acta Palaeontologica Sinica, 43（2）：179-191 (in English with Chinese abstract).

The Middle Ordovician- Llandovery rugose corals are abundant in the

Yangtze region, especially in the Early Silurian. Altogether 123 genera of Rugosa, which contain 4 genera of Middle Ordovician, 25 genera of Late Ordovician, and 94 genera of Llandovery respectively, have been reported from this region, of which 30 genera first appeared in the Yangtze region and then dispersed to Europe and North America and other adjacent regions. The following may represent the earliest occurrence age of the referred genera. *Calostylis* in the Middle Ordovician (Llandeilo)of southern Sichuan; *Aphyllum* and *Cantrillia* in the middle Ashgill of western Zhejiang; the streptelasmatids *Briantelasma*, *Pycnactis* and *Tunguselasma* in the late Rhuddanianof northeastern Guizhou, the columnariids *Ceriaster*, *Stauria*, *Amplexoides* and *Synamplexoides*, and the cystiphyllids *Maikottia*, *Rhizophyllum* among others in the Middle Llandovery of northeastern Guizhou, South China. Based on these data, We may regard that the Yangtze region may have been one of the origin centers for the Ordovician and Silurian rugose corals. This paper deals with the Middle Ordovician to Llandovery rugose coral faunas in the Yangtze region, especially with their palaeobiogeographic affinities. The Middle Ordovician Rugosa of this region is characterized by the calostylids *Calostylis* and *Yohophyllum.* The Late Ordovician (mid-Ashgill) rugosan fauna from the Sanqushan Formation of western Zhejiang Province contains some Australian elements(*Hillophyllum, Bowanophyllum*), while the late Ashgill rugose fauna from the Guanyinqiao Bed in the Upper Yangtze region shows a high degree of similarity to that of North Europe, indicating that Yangtze and Europe have a close palaeobiogeographic affinity with each other. The Llandovery rugose fauna in the Yangtze region is much closer with that of Siberia, Kazakhstan and Australia. (Original abstract)

He X. Y. and Chen J. Q. , 2004. Late Silurian rugose coral fauna from the Qujing district, east Yunnan. Acta Palaeontologica Sinica, 43（3）：303-324，pl. I-III (in Chinese with English abstract).

Late Silurian（Late Ludlow-Early Pridoli）rugose coral fauna from the Qujing district, east Yunnan are studied in detail, and some rugosan genera and species

are reviewed, especially the coral fauna characters and their distribution of the Guandi Formation and Miaogao Formation are discussed. Altogether 22 genera and 44 species of rugose occurred in Late Silurian(including Guandi, Miaogao and Yulongsi formations) of Qujing, east Yunnan(see Tables Ⅰ, Ⅱ). Among them, cystiphylloids *Holmophyllum*, *Cystiphyllum* and *Ketophyllum* are dominant. The columnariids *Kyphophyllum*, *Micula* and *Pilophyllum* and others are present. While the representatives of streptelasmatids are scare, only three genera *Brachyelasma*, *Rukhinia* and *Phaulactis* have been found for first time from east Yunnan. As a whole, the Late Silurian rugosan fauna of east Yunnan has an affinity with contemporary west Qinling forms, and shows to a centain extent similarity to those of contemporaneous beds of Ural. Altogether 23 species comprising 17 genera of rugosa are described, among them 3 species are new, namely *Cystiphyllum minutum* sp. nov. , *Ketophyllum qujingense* sp. nov. and Phaulactis vesicularis sp. nov. (Original abstract)

He X. Y. and Chen J. Q. , 2004. Late Ordovician mass extinction of rugose corals in the Yangtze region. In: Rong Jiayu, Fang Zhongjie(eds.), Biotic Mass Extinction and Recovery of the Paleozoic in South Chian. Hefei: Hefei Science and Technology Press, Chapt 2, Part 6, p. 167-183 (in Chinese with English abstract).

Two phases of the latest Ordovician rugosan mass extinction are recognized based on the study of rugose coral fauna from the Sanjushan Formation(middle Ashgill) in the Lower Yangtze region and the Guanyinqiao Beds(late Ashgill) in the Upper Yangtze region integrated with modification as well as statistical analysis of range and distribution of the genera and species. The first phase took place during the end of Rawtheyan Stage. The Late Ordovician (middle Ashgill) rugosan fauna of Lower Yangtze region contains 16 genera, among which 6 genera(*Cystocantrillia*, *Hillophyllum*, *Bowanophyllum*, *Parastreptelasma*, *Favistina* and streptelasmatid one new genus) (37. 5%) became extinct in the end of Rawtheyan Stage. The second phase happened during the latest Hirnantian. The rugose coral fauna from

the Guanyinqiao Beds of Upper Yangtze region contains 15 genera, among which 9 genera (*Sinkiangolasma*, *Lambeophyllum*, *Kenophyllum*, *Borelasma*, *Salvadorea*, *Ullernelasma*, *Siphonolasma*, *Pycnactoides*, *Bodophyllum*) (60%) became extinct. The present paper deals with the controlling factors of two extinction events and their differences. The global sea-level decline caused by the Southern Hemisphere glaciation at the Late Ordovician and climatic deterioration are the main factors, which resulted in the first phase of rugosan mass extinction during the end of Rawtheyan. In the Lower Yangtze region, because of the beginning time of the first phase of rugosan mass extinction was earlier than brachiopods and graptolites, the authors concluded that the factors of the first phase may be also connected with the Guanxian Orogeny. The second phase of the extinction again related to a rise of global temperature and a sharp rise of sea-level with oceanic water anoxia which caused the demise of the shallow, bottom-living and cool/cold water rugose coral fauna at the late Hirnantian (latest Ashgill) and the earliest Silurian. The two phases were coincided with the star of the Gondwana Supercontinental glaciation and its melting respectively. (Original abstract)

Liao W. H. , 2003. Devonian Biostratigraphy of Dushan, Southern Guizhou and its coral Extinction events. Acta Palaeontologica Sinica, 42(3): 417-427. (in Chinese with English abstract)

The shallow marine Devonian is well developed in Dushan，southern Guizhou and rich in fossil corals，The Devonian corals in Dushan flourished in a nearshore shallow water environment and all coral communities fall in the range of BA3 and BA4（equivalent of the upper part of subtidal）in the Pedder and McLean＇s benthic assemblage scale。

On the basis of study of the Devonian rugose corals in Dushan section, 7 assemblages have been established. Of which the *Utaratuia-Sociophyllum* Assemblage of Longdongshui Member is correlated with the coral assemblage of Hume Formation （Eifelian）from northwestern Canada. The

Columnaria-Dendrostella Assemblage from Tunshang Member may be correlated with the late Eifelian coral assemblages in Germany. The *Paramixogonaria-Jipaolasma* Assemblage from Chipao Member together with the *Endophyllum-Sunophyllum-Argutastraca* Assemblage from Chiwochai Member should be equivalent to European Givetian coral assemblages. The *Sinodisphyllum-Pseudozaphrentis-Mictophyllum* Assemblage from Hejiazhai Member and the Wapitiphyllum-Pseudozaphrentis-Disphyllum. Assemblage from Lujiazhai Member are approximately equivalent to the Frasnian coral assemblages in northwestern Canada. The *Cystophrentis* Assemblage from Kolaoho Formation should be approximately contemporaneous with the European Strunian(latest Famennian) coral assemblages.

Four-times bio-events have been found from the Devonian in Dushan recently. The first occurred at the top of the longdongshui Member, in which all of Favosites disappeared, it may be correlated with the mid-Eifelian event(Oliver and Pedder, 1994). The second appeared at the top of Chiwochai Member, in which a lot of cystomorph corals and *Stringocephalus* died out, it is approximately equivalent to the end-Givetian event(Oliver and Pedder, 1994). The third happened at the bed about 80 m above the lower boundary of Yaoso Formation, a large number of shelly benthos, such as tentaculites, Atrypacea, the characteristic Devonian corals, stromatoporoids, bryozoans and reefs were killed, it should be equivalent to the F-F mass extinction(Kellwasser event in Germany). The fourth found near at the top of Kolaoho Formation, many Strunian(latest Devonian) fauna were replaced by the Tournaisian(earliest Carboniferous) taxa. It should be equivalent to the D-C extinction(Hangenberg event in Germany). (Original Summary)

Neuman B. E. E. , 2003. The new early Palaeozoic rugose coral genera Eurogrewingkia gen. nov. and Fosselasma gen. nov. Proceedings of the Estonian Academy of Sciences, Geology = Eesti Teaduste Akadeemia Toimetised, Geoloogia 52(4): 199-212.

The new genus *Eurogrewingkia* gen. nov. (type species selected here is Grewingkia bilateralis Neuman, 1969) is erected for streptelasmatid rugose corals with *Grewingkia*-like ontogeny lacking a cardinal fossula sensu stricto. In addition, the new genus *Fosselasma* gen. nov. (type species selected here is *Streptelasma unicum* Neuman, 1975) is erected for species with a *Streptelasma-like* ontogeny but provided with a cardinal septofossula. Species of Eurogrewingkia are currently recognized from the Upper Ordovician, Rawtheyan-Hirnantian strata in Europe and North America. Species of Fosselasma are found only in Hirnantian strata in Sweden and Norway. (Original abstract)

Pedder A. E. H. and Murphy M. A. , 2003. The Papiliophyllidae (Lower Devonian Rugosa); their systematics and reinterpreted biostratigraphic value in Nevada. Journal of Paleontology 77(4): 601-624.

Field work has greatly increased the number of well-dated papiliophyllid corals available from Nevada. The established range of the family is expanded from Pragian and lower Emsian to Pragian and almost the entire Emsian. Ranges of species are calibrated against Johnson faunal intervals and a revised Pragian and lowermost Emsian conodont zonation proposed by Murphy for Nevada. Study of all reposited material has led to some revision of every member of the family, *Eurekaphyllum*, previously imperfectly known from a single specimen of vague stratigraphic origin, is shown to be a useful upper Emsian index. Nine reported occurrences of the family in Europe and Asia are re-examined and, except for a possible occurrence on Novaya Zemlya, all are rejected. The three named genera of the family are apparently endemic to the southwestern North American craton. *Papiliophyllum elegantulum asymmetricum* new subspecies, *P. murphyi* new species and *Eurekaphyllum vescum* new species are described by Pedder. (Original abstract)

Rodriguez S. , 2001. Life strategies of solitary undissepimented rugose corals from the upper member of the Picos de Europa Formation (Moscovian,

Carboniferous, Cantabrian Mountains, NW Spain). -Lethaia 34: 203-214; Oslo.

Rugose corals belonging to the orders Metriophyllina, Stereolasmatina and Plerophyllina have been identified in the upper member of the Picos de Europa Formation (Moscovian). Corals occur in crinoidal limestones containing common bryozoans. The coral assemblage shows a high diversity. Mode of preservation and spatial distribution of corals demonstrate close relationships with biogenic components such as crinoids, bryozoans, brachiopods and bivalves. The morphology of corals provides valuable data for identifying their life strategies, four of which have been identified: liberosessile with straight growth, liberosessile with curved growth, fixosessile with straight growth and fixosessile with curved growth. Most corals from the Picos de Europa Formation appear to have been fixosessile with straight growth; they attached themselves to bioclasts and subsequently developed radiciform processes (mainly talons) to remain straight. [Original abstract]

Rodriguez S. and Liao W. H. , 2003. A restudy of *Cystophrentis* Yue, 1931 (Rugosa) from the uppermost Fammenian (Strunian) of South China. Geobios 36（4）：407-419.

The genus *Cystophrentis*, first described by Yu (1931), occurs in South China, Tibet, Viet Nam and Armenia. Its geological age is Strunian (latest Fammenian). It forms the basis for the order Mesocorallia Yu, 1963, regarded as intermediate between the Rugosa and the Scleractinia based on the presence of metasepta between the counter septum and the counter-lateral septa. The genus *Kailingophyllum* Yu and Lin, 1984 was described as being similar to Cystophrentis, but the apparent differences between these genera are no more than ontogenetic variations. Consequently, *Kailingophyllum* is regarded here as a synonym of *Cystophrentis*. Three species from six localities in South China and Tibet are described: *Cystophrentis kolaohoensis* Yu, 1931; *Cystophrentis simplex* (Yu and Lin in Yu, Lin and Fan, 1984) and *Cystophrentis grandis* Kuang in Jia et

al. , 1977. Serial sections and external septal grooves of the corals studied show no insertion of metasepta between the counter septum and the counter-lateral septa in *Cystophrentis*. Thus there is no basis for the recognition of the order Mesocorallia Yu, 1963. (Original abstract)

Salas M. J. , 2003. Ostracodos palaeocopas, leiocopas y eridostracas del Ordovicico de la Precordillera de San Juan, Argentina;Translated Title: Ordovician paleocopid, leiocopid and eridostracan ostracods from the Precordillera of San Juan, Argentina. Ameghiniana 40(3): 345-360.

Ostracod faunas from the Early Llanvirnian to Early Caradocian rocks of the Precordillera Basin (Las Chacritas and Las Aguaditas Formations) are described. One new genus, *Chattertonella* gen. nov. , and nine species are recognized, three of which are new (*Chattertonella rugosa* gen. et sp. nov. , *Saccelatia minuta* sp. nov. and *Conchoprimitia elongata* sp. nov.). Two different associations are recognized, one Early Llanvirnian and another the Early Llanvirnian and another the Early Caradocian in age. They allow local correlation between the basal part of the Las Aguaditas Formation and the Las Chacritas Formation and between the middle part of the Las Aguaditas Formation and the Mogotes Azules section. Two of the nine genera described are endemic, Saccelatia also occurs in Laurentia and Ningulella and Ordovizona are also known in Laurentia and Baltica. (Original abstract)

Schröder St. , 2001. Wenig bekannte rugose Korallen aus dem Mittel- und Oberdevon der Aachener Mulde (Rheinisches Schiefergebirge). -Geologica et Palaeontologica 35: 63-79, 3 Taf. ; Marburg.

Some taxa of insufficiently known rugose corals are described from the Upper Givetian of Friesenrath and the Frasnian-Famennian boundary-beds near Wert in the Aachen Syncline: Tabulophyllum aff. *cylindricum* Walther 1928, *Temnophyllum blacourti* (Rohart 1988), *Spinophyllum* cf. *spongiosum* (Schlüer

1889), *Macgeea recta* (Walther 1928), *Hexagonaria*? sp W, *Frechastraea pentagona minima* (Rozkowska 1953) and Frechastraea cf. carinata Scrutton 1968. Rugose corals are generally rare within this stratigraphical interval and thus are important records for the Aachen Syncline. In addition, clear faunistic relationships in regard to faunas from France (Ferques) and Belgium are recognizable. [Original abstract]

Schröder St. & Salerno C. , 2001. Korallenfauna und Fazies givetischer Kalksteinabfolgen (Cürten-/Dreimühlen-Formation) der Dollendorfer Mulde (Devon, Rheinisches Schiefergebirge). -Senckenbergiana lethaea 81 (1): 111-133, 1 fig. , 5 pls. ; Frankfurt am Main. [German, with English abstract: Coral fauna and facies of a Givetian limestone-sequence (Cürten/Dreimühlen Formation) in the Dollendorfer Mulde (Devonian, Rheinisches Schiefergebirge/Eifel)]

The descriptive terms "Leperditien-Kalke" and "Klotzige Bank-Kalke" were introduced by Krousel (1953) during the reinvestigation of the Dollendorfer Mulde and describe two lower Givetian limestone intervals, each of about 15 to 20 m thickness. As none of those limestones yield biostratigraphically relevant macrofaunas, the age of both deposits can be estimated only approximately, considering the position of both between the well correlated Cürten and Rodert Formations.
Examination of the sections revealed four facies types, characteristic for a shallow marine, peritidal setting. The limestones are composed mainly of calcispere-ostracod-wackestones or peloid calcisphere-ostracod-packstones. Together with amphiporoid-floatstones they indicate lagoonal and restricted environmental conditions. Intercalated amphiporoid rudstones suggest temporarily more agitated water conditions. Remarkable thrombolithic bindstones occur with a partly stromatactoid fabric yielding corticoids and Algae of the genera Issinella Reitlinger 1954 and Jansaella Mamet & Roux 1975. Deposition of several stromatoporoid coral rudstone layers indicates a greater water depth with more open marine influence.

Eleven taxa of rugose corals can be recognized. Most of those are related to the small trochoid zaphrentids or charactophyllids, which were able to survive in the restricted conditions of a lagoonal environment. Common species are *Glossophyllum* sp. cf *schouppei*, *Grypophyllum* sp. and *Sinodisphyllum* sp. *Pseudozaphrentis intermissa* n. sp. Schröder is described as new species. [Original abstract]

Schröder St. & Soto F. , 2003. New Lower Devonian (Emsian) rugose corals from northern Spain (Colle/Leon, southern slope of the Cantabrian Mountains). -Acta Palaeontologica Polonica 48 (4): 547-558; Warszawa.

Two species of Lower Devonian rugose corals are described from the Cantabrian Mountains of Spain: *Cantabriastraea cantabrica* gen et sp. nov. and *Tabulophyllum bonarense* sp. nov. . The development of root-or buffer-like attachment structures (" rhizoid processes ") in *T. bonarense* indicates adaption to the soft substrate and supports corallite stabilization. Because of their strongly everted calices and a corresponding arrangement of trabeculae, the colonies of the genus *Cantabriastraea* are assigned tentatively to the Paradisphyllinae, constituting the first record of the subfamily in Western Europe. Some specimens give information on colony-formation of this taxon, which is induced by strong lateral budding (nonparricidal increase) of a remarkable large and long-lasting protocorallite. [Original abstracht]

Wang X. D. , Sugiyama T. and Zhang F. , 2004. Intraspecific variation in a new solitary rugose coral, *Commutia exoleta*, from the Lower Carboniferous of the Baoshan Block, Southwest China. Journal of Paleotology 78(1): 77-83.

Based on 137 specimens examined, the new species *Commutia exoleta* is characterized by a small, slightly scolecoid shape with 21 septa at a mean maximum corallite diameter of 6 mm (range 3 to 10. 5 mm); a persistent

inner wall, which encloses an aulos with a mean maximum diameter of 1. 2 mm, formed during an early ontogenetic stage when the axial ends of the cardinal, alar and counter-lateral septa fused; short counter septa are lacking in the earliest stage of development. Corallites are highly variable. Characters exhibiting a wide range of variation are: size and shape of corallites, number of septa, diameter of aulos and the timing of its appearance, number of septa connected to the inner wall, and the septal arrangement in each growth quadrant. Combinations of these variable characters result in corallites that are each uniquely different. Variations of those characters are partly due to stressed environments, such as unstable, muddy substrates resulting in corallite rejuvenescence and redirection. (Original abstract)

Zhang Y. B. , Sun Y. L. , Liu J. B. and Han B. F. , 2004. A new species of *Aphraxonia* from the Upper Middle Devonian of the South Tianshan area, Xinjiang, China. Acta Palaeontologica Sinica 43(1): 118-123. (in Chinese with English abstract)

Aphraxonia, a rare Middle-Late Devonian rugosa coral genus with columella structure, was previously only known from two localites: Upper Devonian of Anatolia area, Turkey and the Qiziqiao Formation(Givetian) of Hunan Province, China, including two species: *Aphraxonia taurensis* Unsalaner and *Aphraxonia zhuzhouensis*(Jia). *Aphraxonia zhuzhouensis*(Jia) was originally described by Jia under the genus *Hunanaxonia.* After comparing the main features of *Aphraxonia* Unsalaner, 1951 and *Hunanaxonia* Jia,1977, Hill(1981) thought that no basic differences between the two genera and, thus, he put *Hunanxonia* under the subjective synonyms of *Aphraxonia* Unsalaner, 1951. In this paper, we report a new species of the genus, namely *Aphraxonia wuqiaensis* sp. nov. , collected from the Middle Devonian of the South Tianshan area, Xinjiang. This new species represents an intermediate form between *Aphraxonia taurensis* Unsalner and *Aphraxonia zhuzhouensis*(Jia) in the internal morphological features. It is the first time to confirm the existence of *Aphraxonia* outside the Anatolia area of Yurkey

and Hunan Province of China. This discovery demonstrate that *Aphraxonia* has wide geographical distribution during the Middle to Late Devonian period although it is rare in the fossil record. It also suggests that the South Tianshan area had close biogeographical relationship with both Turkry and Southern China during the Devonian.

The new species was collected from the Middle Devonian Tuogemati Formation on a section, located about 12 km northwest to Tuopa town of Wuqia County, exposed along the highway from Tuopa to Tuergart between milestones 96-99km. On this section, the Tuogemati Formation is about 800-900m thick and mainly consists of thin-bedded marly limestone and bioclastic limestone. It was conformably overlie by a set of Late Devonian flysch accumulation. At its bottom a reversal fault made it directly contacted with Quaternary fluvial sediments.

The new species occurs near the top of the Tuogemati Formation. Aboundant tabulate corals *Alveolites* sp. And *Striatopora* sp. , and brachiopod *Athysina*? sp. Are found to co-exist with the new species. Both Zhou and Chen(1991) and Zhou(2001) mentioned the following fossils were found from the upper part of the Tuogemati Formation around this area, including corals *Temnophyllum* sp. , *Alveolites* sp. , *Disphyllum* sp. , *Neospongophyllum* sp. ; brachiopods *Spinatry* sp. , *Schizophoria* sp. , *Undispirifer* sp. , *Stringocephalus* sp. , *Borthatdtina* sp. etc. These fossils indicate that the Tuogemati Formation is Giveian in age.

Zhang Y. J. , Cheng L. R. , Zhang Y. C. , 2003. New material of Coral fossils in Lower Devonian, Daerdong Formation of Xainza, Tibet. Global Geoloy 22(4): 313-318. (in Chinese with English abstract)

Some coral fossils newly collected from Lower Devonian Daerdong Formation of Xainza, Tibet have been systematically described. There are 7 species of rugosa including one new species, 4 species of tabulatomorphic corals including 2 new species. The three new species are *Hunanaxonia xizangensis* sp. nov. , *Pachycanalicula sparcula* sp. nov and *Paraheliolites zakangensis* sp. nov. The discovery of these corals in this area is beneficial for more understanding the

symbiotic assemblage, evolution of the corals and their biogeography in Early Devonian. (Original abstract)

Tabulata(by Kl. Oekentorp)

Hilali A. , Lachkhem H. & Tourneur F. , 2001. R é partition des tabul é s dans les kess-kess emsiens de Hmar Lakhdad (SE d ' Erfoud, Tafilalt, Maroc). -Geologica et Palaeontologica 35: 53-61, 10 figs. , 1 tab. , 1 pl.

Four families of tabulate corals are abundant in the Hmar Lakhdad Formation: Auloporids, dendroporids and striatoporids are very frequent in the micritic mounds (named "kess-kess"), and favositids are rather common in the argilaceous limestones overlying the mounds. Statistical analysis of tabulate coral distribution shows an evident lateral variation. The western part of the mound range is characterized by a facies with *Bainbridgia*, the central part by a facies with tubular auloporids and ornate dendroporids, and the eastern part by a facies with tubular auloporids. Striatoporids and auloporids, fairly abundant in the western part, are present in all the kess-kess. Each facies corresponds with a part of the range limited by two normal faults. Tabulate coral distribution was probably controlled by synsedimentary tectonics, affecting the three blocks of Hmar Lakhdad. Building corals are absent and only bacterian structures (microstromatolites) were observed in all kess-kess. So the mound cementation was probably controlled by bacterian activity. [original abstract]

Pohler S. M. L. , 2001. Paleoecology, biostratigraphy and palaeogeography of Favositidae(Tabulata) from the Emsian to Middle Devonian Tamworth Group (New South Wales, Australia). -Senckenbergiana lethaea 81 (1): 91-109, 4 fig. , 8 tabs.

Different species and species groups of the family Favositidae from the Emsian and Middle Devonian limestones of the Tamworth Group (N. S. W. , Australia) were investigated with regard to their paleoecology, biostratigraphy and

paleogeography. The Emsian Sulcor Limestone Member yielded *Favosites* sp. aff. *basalticus* (Goldfuss), *Favosites* sp. aff. *salebrosus* Ehteridge, *Favosites stellaris* Chernyshev, *Squameofavosites nitidus* (Chapman), *Sq. bryani* (Jones), *Pachyfavosites rariporus* Dubatolov, and *P. tumulus* Yanet. The Middle Devonian Moore Creek Limestone Member yielded *Favosites* sp. ex gr. goldfussi D'Orbigny, exclusively. In the Emsian limestones favositids occur in different lithofacies, but mostly in stratified biostromes, bedded nodular limestones and *Amphipora* limestones. In the Middle Devonian favositids are found in nodular and lumpy limestones which occur at the base and at the top of some successions. A relationship between sediment composition and septal apparatus could be detected in F. ex gr. *goldfussi.* The favositid faunas from Tamworth display faunal ties to eastern Australia and various regions in Asia. Most striking is the similarity to faunas from the southern Tien Shan region. Complex provincial affinities and high diversities are displayed by Emsian favositids, whereas Middle Devonian faunas are of low diversity and consist of cosmopilitican species. [original abstract]

Scleractinia (by Kl. Oekentorp and X. D. Wang)

Baron-Szabo R. C. 2003. Ontogenetical development in Dasmiopsis lamellicostatus (Reuss, 1854) (Scleractinian; Meandrinidae), a rare coral from the Upper Cretaceous Gosau-Group (Hofergraben, Austria). - Beitr ge zur Geologie des Salzkammerguts. In: Weidinger, J. T. , Lobitzer, H. & Spitzbart, I. : Gmundner Geo-Studien 2: 141-145; Gmunden.

For the first time the ontogenetical development of specimens of the rare taxon *Dasmiopsis lamellicostatus* (Reuss, 1854) from the Austrian 'Gosau Group' at Hofergraben (Santonian) is documented. In the juvenile stage the corallite is circular in outline with septa regularly alternating, becoming elliptical in later ontogenetical stages with 12 septa which are both dominant and nearly equal within a septal arrangement of 5 cycles. [original abstract]

Cuif J. P. , Dauphin Y. , Doucet J. , Salome M. & Susini J. , 2003. XANES mapping of organic sulfate in three scleractinian coral skeletons. Geochimica et Cosmochimica Acta 67(1): 75-83.

The presence and localization of organic sulfate within coral skeletons are studied by using X-ray absorption near edge structure spectroscopy (XANES) fluorescence. XANES spectra are recorded from four reference sulfur-bearing organic molecules: three amino acids (H-S-C bonds in cysteine; C-S-C bonds in methionine; one disulfide bond C-S-S-C bonds in cystine) and a sulfated sugar (C-SO (sub 4) bonds in chondroitin sulfate). Spectral responses of three coral skeletons show that the sulfated form is extremely dominant in coral aragonite, and practically exclusive within both centres of calcification and the surrounding fibrous tissues of coral septa. Mapping of S-sulfate concentrations in centres and fibres gives us direct evidence of high concentration of organic sulfate in centres of calcification. Additionally, a banding pattern of S-sulfate is visible in fibrous part of the coral septa, evidencing a biochemical zonation that corresponds to the step-by-step growth of fibres. (Original abstract)

Filcorn, H. F. , 2003. The Cretaceous corals of Mexico: occurrences and history of research. -Revista Mexicana de Ciencias Geológicas 20 (1): 52-78.

An extensive, detailed compilation of known occurrences and described species of Cretaceous scleractinian corals in the country of Mexico, based on published scientific literature, is presented for the first time. Cretaceous corals have been reported from more than 170 localities in more than 200 published studies dating from at least as early as 1839. Unfortunately, relatively few of these 200 publications actually described coral species: the entire research history on Mexican Cretaceous coral systematic paleontology is contained in only 16 studies. A total of 116 coral species have been described from these occurrences, inclusive of unnamed coral species and with previously suggested synonymies taken into consideration. Overall the coral occurrences span nearly the entire Cretaceous

Period, from the Berriasian through the Maastrichtian, but at least 60 percent of them are from the Early Cretaceous. Furthermore, the vast majority (about 90 percent) of the total number of Mexican Cretaceous coral species are known from the Early Cretaceous. Based on these data, it seems likely that many of the Cretaceous corals of Mexico are still unknown. The detailed review of the literature on Mexican Cretaceous corals presented in this study establishing a modern foundation for future investigations of the paleobiography and systematic paleontology of the members of this significant group of reef-building organisms. [original abstract]

Filkorn H. F. & Alor J. P. , 2004. A new Early Cretaceous coral (Anthozoa: Scleractinia; Dendrophylliina) and its evolutionary significance. Journal of Paleontology, 78 (3): 501-512.

A new coral, *Blastozopsammia guerreroterion*, from the Mid-Cretaceous (upper Albian-lower Cenomanian) Mal Paso Formation of southwestern Mexico is the earliest known and the first Mesozoic colonial member of the Dendrophylliidae, an extant worldwide group. *Blastozopsammia* is characterized by a ramose corallum produced by extratentacular budding, dimorphic corallites, and branches with a continuous axial corallite sheathed in an orderly arrangement of radially arrayed secondary corallites and a robust layer of reticulate coenosteum. This growth form is similar to that of many modern reef-building species of Acropora Oken, 1815 and species of a nonreefal Petrophyllia Conrad, 1855 (=*Archohelia* Vaughan, 1919). Based on corallite configuration, growth form and analogy with Acropora, *Blastozopsammia* had a relatively high degree of colony integration and may have been zooxanthellate. The pinnacle of coral evolution, yet it is rare among the Scleractinia. This growth form has not been recognized in any Cenozoic dendrophylliids. *Blastozopsammia* is an evolutionary enigma because no ancestral lineage or closely related taxon has been identified. However, the most likely origin of colonial Dendrophylliidae is Jurassic or Early Cretaceous Actinacididae. [original abstract]

Kolodziej, B. 2003. Scleractinian corals of suborders Pachythecaliina and Rhipidogyrina: discussion on similarities and description of species from Štramberk-type limestones, Polish Outer Carpathians. Annales Societatis Geologorum Poloniae 73 (3), pp 193-217.

Similarities between scleractinian corals from extinct suborders Pachythecaliina Eliášová 1976 and Rhipidogyrina Roniewicz 1976 are discussed. Corals of the former suborder are considered by some authors as possible descendants of Palaeozoic Rugosa because of their unusual skeletal characters. Some rhipidogyrinans, especially the family Aulastraeoporidae, despite different septal microstructure, share more common features with pachythecaliinans than with other scleractinians. The following skeletal features are discussed to show similarities between these two suborders: (1) wall microstructure and its relations to septa, (2) corallite bilateral symmetry, (3) marginarium, (4) lonsdaleoid and apophysal septa, and (5) internal septal margin. These similarities can be explained by convergence, although phylogenetic relationships of both suborders can not be excluded. This hypothesis needs to be verified by more studies, especially on early blastogeny of rhipidogyrinans and wall microstructure of pachythecaliinans. The systematic part gives descriptions of discussed corals occuring in the tramberk-type limestones, Polish Outer Carpathians (Tithonian-? Berriasian, ? Valanginian). Similarly as in the Štramberk Limestone (Moravia), pachythecaliinans are highly diversified (17 species, 12 genera, including *Pachythecophyllia eliasovae* n. gen. , n. sp.). Rhipidogyrinans are represented by 4 species of 4 genera, including ? *Ogilvinella morycowae* n. sp. [riginal abstract]

Opresko, D. M. (in press for 2004). Revision of the Antipatharia (Cnidaria: Anthozoa). Part IV. Establishment of a new family, Aphanipathidae. Zoologische Mededelingen Leiden, 78 (00): 000-000, figs 1-15.

A new family of antipatharian corals, Aphanipathidae (Cnidaria: Anthozoa:

Antipatharia), is established for *Aphanipathes sarothamnoides* Brook and related species. The family is characterized by tall, conical, acicular or cylindrical spines, which are usually covered to some degree with small tubercles (smooth spines occur in some species), and by polyps that are 0. 5-1. 3 mm in transverse diameter and have small, subequal tentacles. The family is divided into two subfamilies based on differences in the development of the polypar spines. Nine genera are assigned to the family. [original abstract]

Stanley G. D. Jr, 2003. The evolution of modern corals and their early history. Earth Science Reviews 60(3-4): 195-225.

Scleractinians are a group of calcified anthozoan corals, many of which populate shallow-water tropical to subtropical reefs. Most of these corals calcify rapidly and their success on reefs is related to a symbiotic association with zooxanthellae. These one-celled algal symbionts live in the endodermal tissues of their coral host and are thought responsible for promoting rapid calcification. The evolutionary significance of this symbiosis and the implications it holds for explaining the success of corals is of paramount importance. Scleractinia stands out as one of the few orders of calcified metazoans that arose in Triassic time, long after a greater proliferation of calcified metazoan orders in the Paleozoic. The origin of this coral group, so important in reefs of today, has remained an unsolved problem in paleontology. The idea that Scleractinia evolved from older Paleozoic rugose corals that somehow survived the Permian mass extinction persists among some schools of thought. Paleozoic scleractiniamorphs also have been presented as possible ancestors. The paleontological record shows the first appearance of fossils currently classified within the order Scleractinia to be in the Middle Triassic. These earliest Scleractinia provide a picture of unexpectedly robust taxonomic diversity and high colony integration. Results from molecular biology support a polyphyletic evolution for living Scleractinia and the molecular clock, calibrated against the fossil record, suggests that two major groups of ancestors could extend back to late Paleozoic time. The idea that Scleractinia were derived

from soft-bodied, "anemone-like" ancestors that survived the Permian mass extinction, has become a widely considered hypothesis. The 14-million year Mesozoic coral gap stands as a fundamental obstacle to verification of many of these ideas. However, this obstacle is not a barrier for derivation of scleractinians from anemone-like, soft-bodied ancestors. The hypothesis of the ephemeral, "naked coral", presents the greatest potential for solution of the enigma of the origin of scleractinians. It states that different groups of soft-bodied, unrelated "anemone-like" anthozoans gave rise to various calcified scleractinian-like corals through aragonitic biomineralization. Although there is evidence for this phenomenon being more universal in the mid-Triassic interval, following a lengthy Early Triassic post-extinction perturbation, it appears to have occurred at least three other times prior to this interval. This idea suggests that, because of ephemeral characteristics, the skeleton does not represent a clade of zoantharian evolution but instead represents a grade of organization. In the fossil record, skeletons may have appeared and disappeared at different times as some clades reverted to soft-bodied existence and these phenomena could account for notable gaps in the taxonomic and fossil record. A fuller understanding and possible solution to the problem of the origin of modern corals may be forthcoming. However, it will require synthesis of diverse kinds of data and an integration of findings from paleobiology, stratigraphy, molecular biology, carbonate geochemistry, biochemistry and invertebrate physiology. (Original abstract)

Stolarski J. , 2003. Three-dimensional micro- and nanostructural characteristics of the scleractinian coral skeleton: A biocalcification proxy. Acta Palaeontologica Polonica 48 (3), pp 497-530.

The contemporary "two-step model" of growth of the scleractinian skeleton is based mostly on transversely sectioned samples. According to this model, many skeletal elements e. g. , septa are formed in two temporally distinct phases represented by (1) "centers of calcification" that are composed of homogenously distributed microcrystalline or/and organic components and serve as scaffolding

for the further growth of (2) fibrous skeleton. Based on transverse and longitudinal sections and histochemical staining techniques, I demonstrate herein that in extant corals (i. e. , *Stephanocyathus, Flabellum*, *Desmophyllum*, " *Ceratotrochus* ", *Galaxea*, *Platygyra*), the entire septal skeleton is composed of superimposed layers of mineral and organic-enriched phases. These may be interrupted in some directions of growth but in other directions there is continuity between " centers of calcification " and " fibers ", making any distinction between these two structures unclear. As an alternative to the " two-step model ", a " layered model " of skeletal growth is proposed, that explains the differences between " centers of calcification " and " fibers " in terms of differential growth dynamics between these regions. Instead of the traditional but inadequate " trabecular " and " centers of calcification " concepts, a distinction between deposits of the Rapid Accretion Front (dRAF; which in particular cases can be organized into Centers of Rapid Accretion (CRA), and Thickening Deposits (TD) is proposed. In the dRAF region, mineral components, ca. 50 nm in diameter, seem to match the size range of nodular structures recently interpreted as nascent CaCO3 crystals. Remarkable regularity of the mineral/organic phase alternations (microbanding) in the TD skeleton of zooxanthellate corals and lack of such regular microbanding in azooxanthellate coralla is a promising criterion for distinguishing these two ecological coral groups on a skeletal basis, and one that could be applicable to fossils.

Sponges (including Stromatoporoids)

(by D. Janussen and C. W. Stearn)

Brückner A. , Janussen D. & Schneider S. , 2003. Eine neue Poriferen-Fauna aus dem Septarienton (Oligoz n, Rupelium) von Bad Freienwalde (NE-Deutschland) und der erste fossil erhaltene Vertreter der nicht-rigiden Hexactinelliden-Gattung Asconema. Pal ontologische Zeitschrift 77 (2), 263-280.

The hexactinellid sponge fauna, which is described here for the first time, originates from the "Septarienton" (Rupelium, Oligocene) of the "Kirchenziegeleigrube" near Bad Freienwalde (NE Germany). This fauna includes lyssacinosan, as well as hexactinosan species, represented by *Asconema oligocaena* n. sp. (Hexasterophora, Lyssacinosa), the first occurrence of this genus from the fossil record, *Aphrocallistes* sp. (Hexasterophora, Hexactinosa), and *Hyalonema* sp. (Amphidiscophora). The three-dimensional, pyritic body-preservation of these non-rigid sponges suggests fossililization by rapid burial. Episodic mudflows are suggested to be responsible for this. The environment of deposition is suggested to have been a moderately shallow shelf, possibly in the distal range of a delta, characterised by relatively low sedimentation rates and no turbulence, except when disturbed by episodic mudflows. Low energy conditions are a precondition for the settlement of the described Hexactinellida.

Fluegel E. and Singh I. B. , 2003. Stromatoporoid-grade and other sponge fossils from the upper Krol Formation of the Lesser Himalaya (India): implications for the biotic evolution around the Precambrian-Cambrian boundary interval. Facies 49, pp 351-372.

A study of fossils in thin sections of a sample from the uppermost Krol E Member in the Mussoorie Hills of the Lesser Himalaya, India, proves the existence of morphologically differentiated calcified sponges within the Precambrian-Cambrian boundary time interval. The sponges described as *Mussooriella* kroli n. gen. n. sp. and *Maldeotainia composita* n. gen. n. sp. indicate the presence of different organization grades at the Precambrian-Cambrian interval. *Mussooriella* had a calcareous skeleton consisting of skeletal elements composed of an inner laminated part and a distinct peripheral layer with knobs. *Maldeotainia* is characterized by a stromatoporoid-grade growth pattern following a thalamid-grade pattern. The stromatoporoid grade part of the skeleton is very similar to skeletal elements

common in labechiid Ordovician and younger stromatoporoids. *Maldeotainia* also shows criteria of Early Cambrian fossils originally described as stromatoporoids and later excluded from this group and transferred to archaeocyathids. These similarities point to an Early Cambrian age of the fossil-bearing horizon in the topmost Krol E member. Growth cavities within crypts indicate that the sponges might have contributed to the formation of small metazoan reef-like structures. Although the study is based on limited material, and many interpretations are still tentative, a thorough documentation of the preliminary results seems reliable considering the high potential of fossils of the upper Krol Formation as an important source in the understanding of early metazoan differentiation. [original abstract]

Hoffmann F. , Janussen D. , Dr se W. , Arp G. & Reitner J. , 2003. Histological investigations of organisms with hard skeletons: a case study of siliceous sponges. Biotechnic and Histochemistry 78, (2-4), 191-199.

Siliceous and calcareous sponges commonly are treated with acid to remove the spicules prior to embedding and cutting for histological investigations. Histology of spiculated sponge tissue represents a challenging problem in sponge histotechnology. Furthermore, fluorescence in situ hybridization (FISH), a key method for studying sponge-associated microbes, is not possible after acid treatment. For a broad range of siliceous sponge species, we developed and evaluated methods for embedding in paraffin, methylmethacrylate resins, LR White resin and cryomatrix. Different methods for cutting tissue blocks as well as mounting and staining sections also were tested. Our aim was to enable histological investigations and FISH without prior removal of the spicules. To obtain an overview of tissue and skeleton arrangement, we recommend embedding tissue blocks with LR White resin combined with en bloc staining techniques for large specimens with thick and numerous spicules, but paraffin embedding and subsequent staining for whole small specimens. For FISH on siliceous sponges, we recommend Histocryl embedding if the spicule content is

high, but paraffin embedding if it is low. Classical histological techniques are used for detailed tissue examinations.

Ilan M. , Gugel J. , Galil B. S. and Janussen D. , 2003. Small bathyal (sponge) species from East Mediterranean revealed by new soft bottom sampling technique. Ophelia 57, (3), 145-160.

This first study of soft bottom sponges from the Levantine bathyal employed a device comprising a plankton net secured atop a Marinovich type semi-balloon trawl. All of the nearly 500 specimens collected were identified to four sponge species. All four species are of a very small body size. Sponges were not retained by the larger mesh Marinovich trawl net. The study describes a new polymastiid species *Tentorium levantinum* n. sp. , and a new *Rhizaxinella shikmonae* n. sp. in addition to two Calcareans: *Sycon faulkneri* n. sp. and a *Plectroninia* sp. that appears to be a new species. These sponges, which inhabit soft bottom environments, have evolved morphological features such as unattached groundbased cones with a broad base (*Tentorium levantinum*), or a basal anchoring tuft (*Rhizaxinella shikmonae*). The absence of these species from previous records of the Mediterranean bathyal may have resulted either from overlooking the small sized species in soft bottom environments for lack of adequate collecting technique or scarcity of studies.

Janussen D. & Reiswig H. M. , 2003. Re-description of *Cyathella lutea* Schmidt and formation of the new subfamily Cyathellinae (Hexactinellida, Aulocalycoida, Aulocalycidae). Senckenbergiana Biologica 82 (1/2), 1-10.

Cyathella is a monospecific hexactinellid sponge genus, whose systematic position within the Hexactinellida has been so far unresolved. The original material of the type species, *C. lutea Schmidt* 1870, which has been re-examined, is here re-described and the genus is revised. The dictyonal skeleton of C. lutea is investigated, and a new sub-family Cyathellinae is erected to comprise this

special type of skeletal architecture. *C. lutea* is compared with fossil hexactinellid species attributed to this new sub-family.

R**acki G. and Sobstel M. , 2004.** Very large stromatoporoid indicating Early Frasnian reef core (Holy Cross Mts. , Poland). Geological Quarterly 48, 83-88.

A large stromatoporoid *Actinostroma* cf. *crassipilatum* Lecompte, 1951, at least 0. 85 m in height, occurs in the Sluchowice quarry, Kielce, Holy Cross Mountains. The sponge occurs in growth position within Early Frasnian (*transitans* Zone) intraclast-rich reef-rubble deposits. The unique preservation of the reef-builder close to a reef core is implied for the northern flank of the developing Dyminy Reef during the maximum expansion northward into the Kostomloty intrashelf basin. [original abstract]

Riding R. , 2004. Solenopora is a chaetetid sponge, not an alga. Palaeontology 47 (1), 117-122.

For over 100 years the Ordovician fossil *Solenopora* (Dybowski) has been widely considered to be a calcified red alga. The type species *Solenopora spongoides* consists of tubes with longitudinally flexuous walls, lobate-petalloid cross sections 30-175 µm across with septal projections and sporadic cross partitions. This internal morphology is not characteristic of calcified red algae but is consistent with the original interpretations of *Solenopora* as a chaetetid and with subsequent recognition of chaetetids as sponges. *Solenopora* is widely misidentified in Silurian and younger rocks. Removal of *Solenopora* from the algae underscores the need to comprehensively reassess the palaeoecological and phylogenetic significance of numerous disparate Ordovician to Miocene fossils currently classed as Solenoporaceans. [original abstract]

Rosenheim B. E. , Swart, P. K. , Thorrold, Willenz P. , Berry L. , and Latkoczy C. , 2004. High resolution Sr/Ca records in sclerosponges calibrated to

temperature in situ. Geology 32, 145-148.

Ratios of strontium to calcium have been analysed by laser-ablation inductively coupled plasma-mass spectroscopy (LA-ICP-MS) in a skeletal section of the sclerosponge *Ceratoporella nicholsoni.* The growth period, representative of 3 yr, was stained in the skeleton with a fluorochrome (calcein). Temperatures were recorded at 2 h intervals within the shallow cryptic reef enclosure that the sclerosponge inhabited on the northern coast of Jamaica, allowing the formulation of a direct empirical relationship between Sr/Ca and temperature. To verify this calibration, Sr/Ca ratios of two sclerosponges of the same species from depths of 67 m and 136 m in Exuma Sound, Bahamas, were analysed by LA-ICP-MS and compared to the temperatures from these depths over a decade prior to collection. The result is an independently verified, high-resolution empirical calibration for the temperature sensitivity of Sr/Ca ratios in the aragonite skeleton of sclerosponges from Jamaica and the Bahamas. The calibration is a first for *C. nicholsoni* and indicates that the sclerosponges are more sensitive temperature recorders than zooxanthellate corals. It represents an important step in establishing skeletal geochemistry of sclerosponges as a proxy of temperature in the upper 250 m of the ocean. [Original abstract]

Young G. and Kershaw S. [**in press**]. Classification and controls of internal banding in Palaeozoic stromatoporoids and colonial corals. Palaeontology.

Palaeozoic corals and stromatoporoids exhibit a variety of internal banding phenomena, many of which have been commonly interpreted as annual growth bands. We evaluate bands through analysis of colonial corals and stromatoporoids from three stratigraphic intervals: Upper Ordovician of Manitoba Canada, and Llandovery-Wenlock and Ludlow of Gotland, Sweden. Banding features are divided into four categories: (1) absence of banding; (2) density banding formed by variation in density or form of elements; (3) growth-interruption banding indicating growth cessation and regeneration; and (4) post-mortem banding caused by compaction or diagenesis. For discrimination of band types, it is

essential to examine internal structures and skeletal margins in thin sections or acetate peels.

Species vary considerably in degree and type of banding; each has a distinct pattern of variation. We propose criteria to determine if banding is consistent with seasonally-induced growth variation: (1) consistency in band character and thickness; (2) continuity of skeletal growth; (3) marginal features; and (4) evidence of diagenetic alteration. Density bands in tabulate and rugose corals probably represent annual growth variations, but results for stromatoporoids are more ambiguous; although stromatoporoids commonly show banding, unequivocal density banding is poorly developed and, growth interruption generated most stromatoporoid banding. Cerioid rugose and tabulate corals possess the thickest density bands; the thinnest bands are in stromatoporoids and heliolitid tabulates. [abstract]

Reefs(by X. D. Wang and Kl. Oekentorp)

Atlasman Y. Y. , 2004. Morphology of ancient reef massifs of Permian near-Urals and their oil-bearing character. Pertroleum Geology 38: 191-202. 2004.

Baikov A. A. , 2004. Duration of the lateral paragenetic reef-evaporite system formation. Lithology an Mineral Resources 39(2): 135-144.

Duration of the functioning of elements of the lateral paragenetic reef-evaporite systems in Cambrian and Late Jurassic has been calculated. Discrepancy between total durations of the vertical growth of barrier reefs and evaporite formation varies by a factor of 3-50. Neither barrier reefs were growing up nor salt was deposited in halogenic basins for enormous time spans. Specific features of the reef-evaporite system should be taken into account in the estimation of ore potential (in particular, presence of sulfides of Pb, Zn, and other metals) in barrier-reef massifs. (Original abstract)

Beauchamp B. and Olchowy B. , 2003. Early Permian buildups (Tolkien reefs) associated with subaqueous evaporites, Canadian Arctic; a record of syn-tectonic to post-tectonic reciprocal uplift and subsidence. In: Permo-Carboniferous carbonate platforms and reefs. Special Publication -Society for Sedimentary Geology 78: 133-153.

Twenty-six reef-mounds of Early Permian (Middle or Late Asselian) age crop out along the north shore of Greely Fiord on west-central Ellesmere Island, Canadian Arctic Archipelago. Each reef was attributed the name of a character from J. R. R. Tolkien's "The Lord of the Rings". The reefs interfinger with evaporites in the upper part of the Mount Bayley Formation, immediately below the Tanquary Formation. The reefs grew at the northern margin of a large depression of the Sverdrup Basin referred to as the Fosheim-Hamilton sub-basin, which is separated from the main Sverdrup Basin by the Elmerson high, an elongated structure of probable compressional origin. The Tolkien reefs range from 50 m to over 130 m in thickness and between 50 m and 500 m in width and length. The buildups have a massive core around which are wrapped a series of well-defined, variably steep beds (flanks), many of which display a sharp erosional base. Facies of the core and inner flank comprise: bryozoan-Tubiphytes-stromatactoid (sponge) boundstone; bryozoan cementstone; bryozoan mudstone-wackestone; and bryozoan (fusulinacean) packstone-grainstone. Facies of the outer flank include: algal boundstone; and fusulinid-algal grainstone-rudstone. Facies that occur both in the inner and outer flanks include carbonate breccia and moldic dolomicrite. The Tolkien Reefs of west-central Ellesmere Island recorded the transition from an evaporite-dominated succession (Mount Bayley Formation) to an evaporite-free succession (Tanquary Formation). The reefs grew south of a major structural element--the Elmerson high--through the complex interplay between high-order to low-order relative sea-level fluctuations driven by tectonics, glacio-eustasy, and evaporative drawdown. The Tolkien Reefs recorded the rapid transition between a long episode of differential, and in part fault-controlled,

syntectonic subsidence and a long period of slower, regional post-tectonic passive subsidence. While the former can be associated with a pulse of compressional tectonics that affected many areas of the Sverdrup Basin, the latter represents a phase of tectonic quiescence. (Original abstract)

Bellwood, D. R. , Hughes, T. P. , Folke, C. & NystrÖm, M. , 2004. Confronting the coral reef crisis. -Nature, 429.

The world-wide decline of coral reefs calls for an urgent reassessment of current management practices. Confronting large-scale crisis requires a major scaling-up of management efforts based on an improved understanding of the ecological processes that underlie reef resilience. Managing for improved resilience, incorporating the role of human activity in shaping ecosystems, provides basis of coping with uncertainty, future changes and ecological surprises. Here we review the ecological roles of critical functional groups (for both corals and reef fishes) that are fundamental to understanding resilience and avoiding phase shifts from coral dominance to less desirable, degraded ecosystems. We identify striking biogeographic differences in the species richness and composition of functional groups which highlight the vulnerability of Caribbean reef ecosystems. These findings have profound implications for restoration of degraded reefs, management of fisheries, and the focus on marine protected areas and biodiversity hotspots as priorities for conservation.

Chen M. , Wang J. , Tan F. W. and Du B. W. , 2003. The planar distribution and signigicance of the organic reefs in the Lower Cretaceous Nangshan Formation in the Coqen Basin, Xizang. Sedimentary Geology and Tethyan Geology 23(4): 68-70. (in Chinese with English abstract)

The Coqen Basin is located in the hinterland of the Qing-Xizang Plateau. Eight organix reef sections have been identified in the basin along the

Qiekan-Guchang-Luobo-Dangqiongco fault zone. It is inferred, from the radiolarian siliceous rocks and volcanix rocks, that the fault zone should be a facies-controlling fault zone, where the deep-water deposits including platform-margin slope and basin deposits were once accumulated. Afterwards these deep-water deposits disappeared within the fault zone due to subsequent reactivation of faulting. The organic reefs along the both sides of the fault zone shoule be assigned to the platform-margin reefs. (Original abstract)

Coniglio M. , Frizzell R. and Pratt G. R. , 2004. Reef-capping laminites in the Upper Silurian carbonate-to-evaporite transition, Michigan Basin, south-western Ontario. Sedimentology 51: 653-668. 2004.

Silurian pinnacle reefs in the subsurface of the south-western Ontario portion of the Michigan Basin display a variety of laminated carbonates (laminites) within predominantly muddy reef-capping facies in the upper part of the Guelph Formation and the overlying A-1 Carbonate of the Salina Group. Laminites, which are limestone, dolomite or partially dolomitized limestones, have a range of morphologies, from simple planar to a variety of wavy and serrated forms. Individual laminae are composed mainly of micrite, microspar or replacive dolomite, and vary internally from isopachous and continuous over the diameter of the core to non-isopachous and often discontinuous. Clotted and peloidal micrite, sometimes defining small knobs and chambers, is interpreted as being microbial in origin and occurs within all types of laminites. Fibrous cement locally comprises laminite clasts in breccias or coats clasts in breccias, and also occurs as spherulites in the interparticle spaces in breccias. Although similar laminites have been described from elsewhere in the Michigan Basin and interpreted as caliche, travertine and abiotic subtidal stromatolites, the laminites in south-western Ontario are most realistically regarded as microbial. The causes for the variations in morphology and characteristics of the constituent laminae are uncertain, although fluctuations in local microenvironmental conditions would

have been important, set against a backdrop of an increasingly restricted overall setting. Caliche or travertine origins for these laminites are unlikely in general, except perhaps locally at the subaerial exposure surface at the tops of pinnacle reefs. (Original abstract)

Copper P. and Scotese C. R. , 2003. Megareefs in Middle Devonian supergreenhouse climates. In book: Extreme depositional environments; mega end members in geologic time. In: Extreme depositional environments; mega end members in geologic time. Special Paper-Geological Society of America 370: 209-230.

A newly refined reef database, modified to calculate reef tracts in relation to major tectonic plates, and with new paleogeographic maps, indicates that the largest known, and latitudinally most widespread Phanerozoic reefs developed during the Middle Paleozoic (Siluro-Devonian), with an acme in the Middle Devonian. Expanding during times of exceptional sea-level highstands and widespread epicontinental shallow seas, this 26 m. y. long acme of coral-sponge reef growth coincided with the warmest global temperatures known for the Phanerozoic, i. e. , with a “supergreenhouse” climate mode well above Holocene interglacial norms. During the Middle Paleozoic, reefs were particularly abundant, occupying large, continental seaboard, carbonate platforms, and vast inland epicontinental seas. Examples of such “extremes” occurred mostly on passive margin settings, and extensive flooded continental interiors, e. g. , the 1700-3000 km long tracts of the Western Canada Sedimentary Basin, Canadian arctic (Innuitian platform), eastern Laurentia “Old Red Continent” (United Kingdom to Poland), eastern Russian Platform (northeast Laurentia), Ural “Fold Belt” (eastern slopes of Urals), Siberia, northwest Africa, and South China. Smaller scale reef belts between 700 and 1300 km long were constructed on isolated tectonic terranes facing Gondwana on the north (Pyrenees, Afghanistan-Pakistan), Mongolia, Kolyma-Chukot, and North China. Large basins and flooded shelf areas, and the reefs featured within them, were not

persistently developed throughout the Middle Paleozoic. They especially characterized the middle Emsian through Givetian (late Early Devonian-Middle Devonian). The following Frasnian (Late Devonian) showed more restricted and confined distribution of coral-stromatoporoid reefs, and during the Famennian, coral-stromatoporoid reefs "crashed" and were replaced by calcimicrobial reefs and platforms. During the latter phases of the Frasnian/Famennian mass extinctions, such microbial reefs were confined to relatively small areas, and metazoan reefs were nearly entirely obliterated, being confined to rare stromatoporoid patch reefs or lithistid mounds. Coral reefs were completely absent during the 21 m. y. long Famennian interval, and no real recovery of "keystone" frame-building, colonial corals took place in reef settings. The Famennian coincided with repeated glaciations, sharp sea-surface cooling events, sea-level drawdowns, and concurrent, matching stable isotope excursions. (Original abstract)

Forsythe G. T. W. , 2003. A new synthesis of Permo-Carboniferous phylloid algal reef ecology. In: Permo-Carboniferous carbonate platforms and reefs. Special Publication-Society for Sedimentary Geology 78: 171-188.

The phylloid algal genera *Eugonophyllum* and *Archaeolithophyllum* are common constituents of Virgilian and Wolfcampian reef limestones in the Hueco Mountains of Texas. These algae form bioherms and biostromes and are volumetrically important contributors to both the reef and offreef sediment budget. Reefs constructed by phylloid algae have long been considered as ecologically simple communities that lack dominant framebuilding organisms. The previously accepted constructional mechanism for reef formation has been inferred to be sediment baffling and trapping, mainly by erect phylloid algae. This new, detailed analysis of phylloid algal growth framework, however, clearly shows that these algae were in fact capable of forming a rigid framework. Phylloid algae, mostly *Eugonophyllum*, together with the problematicum *Tubiphytes* and the red alga (?) *Archaeolithoporella*, formed complex, multiple encrustations (both in vivo and

post mortem) and were a fundamental element of reef construction. Much of the micrite in these reefs, often regarded as a sediment, has been identified as microbialite; this microbialite is important in binding and stabilizing the initial reef framework created by the phylloid algae. A dominant ecological succession was identified from the *Eugonophyllum* communities: 1. a pioneer community of phylloid algae would initially stabilize the substrate; 2. this would enable an encrusting community of mostly *Tubiphytes*, *Archaeolithoporella*, and microbialite to develop, followed by 3. a climax community of larger calcisponges. In the *Archaeolithophyllum* communities, the thalli were largely constratal (organisms not substantially elevated above the substrate) and lacked any obvious microbialite association. The resultant *Archaeolithophyllum* communities therefore did not develop any significant depositional relief and thus formed biostromes. (Original abstract)

Greenstein B. J. and Pandolfi J. M. , 2003. Taphonomic alteration of reef corals; effects of reef environment and coral growth form; II, The Florida Keys. Palaios 18; 6, Pages 495-509. 2003.

In a companion study to earlier work in the Indo-Pacific, taphonomic alteration in reef-coral death assemblages was assessed in four distinct reef habitats ranging from 2-30 m water depth in the Florida Keys reef tract. Physical and biological taphonomic attributes measured from coral specimens showed great variability with respect to reef environment. Physico-chemical degradation (abrasion and dissolution) was greatest in reef-crest and patch-reef environments. With the exception of encrusting foraminifera, coverage by epi-and endobionts was higher in deep-reef environments (20 m and 30 m). Variability in dissolution and abrasion is likely the result of the different energy regimes present in the reef habitats examined. Variability in biological attributes results from a combination of increased residence time of coral skeletons on substrates in deep-reef environments, higher overall coral skeletal densities of corals inhabiting deep reef environments, and increased nutrient availability in the deep reefs sampled. Clear gradients in the degree of taphonomic alteration of reef corals with reef habitat

indicate the utility of corals as taphofacies indicators in ancient reef settings. In contrast to shallow-water reefs on the Great Barrier Reef, taphonomic alteration of corals in the Florida Keys was equitable across growth forms. (Original abstract)

Hunt D. W. , Fitchen W. M. and Kosa E. , 2003. Syndepositional deformation of the Permian Capitan reef carbonate platform, Guadalupe Mountains, New Mexico, USA. Sedimentary Geology 154(3-4): 89-126.

Permian shelf strata equivalent to the Capitan reef are cut by at least 13 closely spaced syndepositional dip-slip faults in Slaughter Canyon, Guadalupe Mountains, New Mexico, USA. The control of five of these faults on platform development, architecture, stratigraphy and diagenesis is revealed by an integrated stratigraphic, sedimentological and structural framework within a 500-m-wide and 200-m-high outcrop window. Here, faulting and fault-related deformation acted as a primary control on changes in thickness, facies and stratal geometry, and resulted in the local steepening, shallowing and even the reversal of dip in shelf strata. The role of primary depositional relief in controlling changes in thickness and stratal geometry was of secondary importance. The relationship between geopetal fabrics (average dip=12 degrees towards 141 degrees) and bedding shows that during deposition of the Yates Formation fault growth was concurrent with down-to-the-basin tilting (and rotation?) of at least 6-8 degrees . This tilting appears to have been the main control on the down-dip expansion of shelf strata towards the basin. A further 4-6 degrees of basinward tilt occurred after fault growth, during deposition of the Tansill Formation and later. The syndepositional faults reported here have a maximum displacement of 24 m. Most tip-out below asymmetric growth folds and have high displacement-distance gradients typical of growth faults and faults cutting unlithified strata. The average rate of fault displacement (0. 021 m/ka) and the maximum rates of fault propagation (0. 088-0. 123 m/ka) were normally less than the platform accumulation rates (0. 053-0. 336

m/ka). Thus, the faults were normally blind and rarely broke the platform top so that slumps and fault-scarp degradation breccias are rare. The fault zones were substantially modified by diagenesis during platform development. They are up to 9 m wide, taper both up and downward, have irregular margins and complex fills mainly of sedimentary origin. Their margins and fill were subject to extensive modification by karstic(?)/mixing zone dissolution, gravitational collapse and dolomitising fluids. Consequently, tectonic fabrics and kinematic indicators are rare. Preserved tectonic fabrics consistently indicate a normal and reverse dip-slip sense of movement. Previously, these faults were mistaken for "neptunian" dykes and fissures, so that the Seven Rivers and Yates 1-2 HFS shelf stratigraphy has been miscorrelated across them. It is apparent that the stratal relationships exposed in the Guadalupe Mountains do not simply preserve the original depositional morphology of the Capitan-equivalent shelf. The subsidence history, stratigraphy and development of the platform succession is more complex than previously thought. The study has important implications for many aspects of the Capitan system, including: (i) shelf-reef correlations, (ii) the controls on platform architecture and development, (iii) Capitan reef palaeobathymetry, (iv) diagenesis, and (v) the amplitude of sea-level changes affecting the platform's stratigraphic development. (Original abstract)

Li Y. and Kershaw S. , 2003. Reef construction after extinction events of the latest Ordovician in the Yangtze Platform, South China. Facies 48, 269-284.

Early Silurian reef reconstruction on the Yangtze Platform, in the northern part of the South China Block, is preceded by a combination of regional and global processes. During most of Ashgill time (Late Ordovician), the area was dominated by Wufeng Formation deep water graptolitic black shales. Reefs largely disappeared in the middle of the Ashgill Stage, from the northwestern margin of Cathyasian Land (southeastern South China Block), in advance of the

Late Ordovician glaciation and mass extinction, due to regional sea-level changes and regional uplift, unrelated to the mass extinction itself. Late Ordovician microbial mudmound occurrence is also found in the western margin of the Yangtze Platform, its age corresponding to the Dicellograptus complexus graptolite biozone of pre-extinction time. On the Yangtze Platform, a thin, non-reef-bearing carbonate, the Kuanyinchiao Formation (= Nancheng Formation in some sites), thickness generally no more than 1 m, occurs near several landmasses as a result of Hirnantian regression. Reappearance of the earliest Silurian carbonates consisting of rare skeletal lenses in the upper part of Lungmachi Formation, are correlated to the ascensus graptolite biozone, early Rhuddanian of Shiqian, northeastern Guizhou, near Qianzhong Land. Carbonate sediments gradually developed into beds rich in brachiopods and crinoids in the lower part of Xiangshuyuan Formation, middle Rhuddanian. In the middle part of Xiangshuyuan Formation, biostromes, containing abundant and high diversity benthic faunas such as corals, crinoids and brachiopods, show beginnings of reconstruction of reef facies. Substantial reef recovery occurred in the upper part of Xiangshuyuan Formation, lower Aeronian, as small patch reefs and biostromes. During the late Aeronian, carbonate sediments, especially reefs and reef-related facies, expanded on the upper Yangtze Platform, and radiation of reefs occurred in Ningqiang Formation, upper Telychian. The long period of reef recovery, taking several million years, remains difficult to explain, because redistribution of any refugia faunas would be expected to take place soon after the extinction. Reefs and reef-related facies subsequently declined after Telychian time due to regional uplift of the major portion of the Yangtze Platform. Carbonate facies are therefore uncommon in South China during the rest of Silurian time. [Original summary]

Li Y. , Kershaw S. and Mu X. , 2004. Ordovician reef systems and settings in south China before the Late Ordovician mass extinction. Palaeogeography, Palaeoclimatology, Palaeoecology 205: 235-254.

Ordovician reefs of the South China Block occur chiefly in three stratigraphic units: (1) the middle Tremadoc Fenhsiang Formation and the upper part of the Lunshan Formation; (2) the late Tremadoc Hunghuayuan Formation; and (3) the middle Ashgill Xiazhen, Sanjushan and Daduhe Formations. The region therefore records part of the Early Palaeozoic reef expansion episode, and permits a broader assessment of change in Ordovician reef facies. During middle Tremadoc time, lithistid sponge-bryozoan-*Calathium*-calcimicrobially-dominated patch reefs of the Fenhsiang Formation occur in the high energy belt of the central Yangtze Platform. Columnar non-skeletal stromatolites of the Lunshan Formation (coeval with Fenhsiang Formation) occur on the southeastern margin of the platform, where low diversity reef-attached organisms, and the generally fine-grained character of the sediment, are consistent with a depth below normal wave base. *Calathium* and lithistid sponges were the principal reef-builders of late Tremadoc reefs, and were widespread in the areas of Yichang, (Hubei Province) and Dongzhi, (Anhui Province), from the platform centre to its margin settings. Bryozoan reef builders occur only in the platform centre with a high diversity of reef dwellers such as brachiopods, trilobites and nautiloids. However, during the same time, at the platform margins, microbes played an important part in reef-building together with *Calathium* and lithistid sponges. The middle-late Tremadoc lithistid sponge-bryozoan-*Calathium*-microbial community was replaced by a middle Ashgill coral-stromatoporoid community, and shows that the succession of community replacement during the Ordovician took a relatively long time. Restricted by the black shales of the main part of the Yangtze region, middle Ashgill reef complexes can be found only on the northeast platform of Cathaysian Land, between the Yushan (Jiangxi) and Changshan (Zhejiang) regions. Carbonate mudmounds are present on the western margin of the Yangtze Platform. On the northeast platform of Cathaysian Land, patch reefs (some higher relief) with talus, and biostromes of the Xiazhen Formation, consist of high-diversity biotas of corals, stromatoporoids, calcimicrobes, brachiopods and gastropods. The Sanjushan Formation is age-equivalent to the Xiazhen Formation, and contains carbonate mudmounds that are composed of abundant calcareous

algae and calcimicrobia. Uplift forced a northward extension of Cathaysian Land and caused a regional relative sea-level fall, eliminating this reef complex prior to the first extinction event of the Late Ordovician. The Daduhe Formation carbonate mudmounds occur in the nearshore belt of Kangdian Land (western margin of the Yangtze Platform) and are paraconformably overlain by the Hirnantian Nancheng Formation. In total, the Ordovician reefs of south China show a range of habitats and controls on growth and demise. [Original abstract]

Lin Q. X. , Deng Z. L. and Wang G. C. , 2003. Study on Early-Middle Permian Reef and its sequence stratigraphy in Maerzheng Area, Eastern Kunlun. Earth Science - Journal of China University of Geosciences 28(6): 601-605. (in Chinese with English abstract)

The paper discusses the nature and evolution of reef based on the study of the Early-Middle Permian reef section in Maerzheng, eastern Kunlun and the sequence stratigraphy of the reef. The reed can be divided into 12 reef-building cycles, including 5 third class sequences, on the basis of rock features, biocommunities and sea level changes. Moreover, it puts forward the basic rule of reef development on the continental margin in comparison with those reefs of Early-Middle Permian in eastern Kunlun and in the Yangtz platform. (Original abstract)

Liu X. H. , Liu Z. H. , Yang M. D. , Yang R. F. , Xiao Y. J. and Wang Y. , 2004. A preliminary study on the Devonian Buzhai Reefs in Southern Guizhou. Chinese Journal of Geology 39(1): 92-97. (in Chinese with English abstract)

The Devonian Buzhai reefs southern Guizhou developed in the Jipao and Jiwozhai members of the Dushan Formation. The reefs distributed along the boundary between the platform and plat-form-basin and grew on a narrow elevated area, caused by a syn-sedimentary fault. They were mostly frame reefs,

built mainly by *Stromatopora-Alveolites* community, which was very important reef building community, characterized by the massive stroamtoporoids and various tabulate corals. Some of them were baffle reefs, built mainly by blue-green algae community, which was dominated by columnar stromatolites. The reef complex could be divided into six facies, and four subfacies could be distinguished in the reef facies. The developments of reefs was largely controlled by the sea transgression and regression and included two large cycles. (Original abstract)

Liu Z. H. , Liu X. H. , Yang M. D. and Yang R. F. , 2003. Palaeontology and palaeoecology characteristics of Devonlan reefs in Buzhai of Guizhou. Journal of Xiangtan Mineralogical Institute 18 (3): 29-32. (in Chinese with English abstract)

Devonian reefs in Buzhai of Guizhou developed in the Jipao Member and Jiwozhai Member of Dushan Formation. They are mostly frame reefs, built mainly by stromatoporoids and tabulate corals. Some are the baffle reefs, built mainly by dendroid tabulate corals or algae. Four communities and an association are recognized in the reef complex. The *Ilmeria-Classialveolites* community is characterized by small brachiopods and dendroid tabulate corals and occupied in the lower-turbulent shallow sea. The *Thamnopora-Stringocephalus* community consists of the dendroid tabulate corals and big brachiopods and develops in the open shallow sea. The *Stromatopora-Alveolites* community is the very important reef-building community, characterized by the massive stromatoporoids and various corals. The blue-green algae community is the builder of the baffle reefs. The *Cyclocyclicus-Clathrocoilona* association is composed of the crinoids and thin-bed stromatoporoids and develops in bank facies. By the ecological analysis and comparison with the reefs in neighboring areas, the reef complex developed in a stabile shallow marine environments, where was more suirtable for growth of reef-build organisms, 2figs. , 9refs. (Original abstract)

Liu Z. H. , 2003. Communities, palaeogeography and reefs of Middle Permian Qixia period in Hunan. Chinese Journal of Geology, 38(2): 190-199. (in Chinese with English abstract)

Various fossil communities on different places indicated a shallow marine with various depositonal environments developed in Hunan during the Qixia Period of Middle Permian. The *Stigmaria* and Skolithos communities indicated the environments of seamarsh(or littoral depression) and supratidal respectivelyh. The *Pycnostroma* community meant a very shallow turbulent environment, including the intertidal zone and very shallow subtidal zone. The Orthotetina community was characteristic of the nearshore subtidal environment with soft-mud substratum. The *Lophophyllidium* community occupied tht underturbulent subtidal environment, suffered occasionally by storm turbulence; and the *Wentzellophyllum* community showed that clear subturbulent subtidal environment, where compound rugose corals were broken and overthrown frequently by storms. The trace-fossil *Zoophycos* community developed in a clear and relatively turbulent subtidal environment, where was very suitable for flourishing og benthic organisms.

In the Sangzhi-Shimen, Chenxi-Huaihua and Dongkou-Xinhua areas, the *Stigmaria* community developed well at the beginning of Qixia Period, indicatin environments of seamarsh or littoral depression. Then the *Orthotetina* and *Zoophycos* communities dominated, meaning a relatively restricted sea near the oldland. In Liangyuan-Liuyang, the *Skolithos* and *Pecnostroma* communities at the beginning of Qixia Peroid proved a wide tidalflat zoen or very shallow subtidal zone. In Shaoyang-Leiyang, the *Skolithos* and *Pecnostroma* communities never found, the *Lophophyllidium* and *Zoopycos* communities supported an evidence of the area far away from the oldland and the environements being more restricted.

Based on distributions of the various communities, five paleogeographic unites could be divided in Qixia Peroid: the Sangzhi-Shimen littoral-shallow sea, Chenxi-Huaihua littoral-shalloe sea, Dongkou-Xinhua littoral-shallow sea,

Lianyuan-Liuyang open shallow sea and Shaoyang-Leiyang restrict shallow sea. The reefs of Qixia Peroid, composed of the sponges of *Pronidella* community and firstly discovered from Shuangshouting to Xiandong of Lianyuan, Central Hunan, was located on the margin of the Lianyuan-Liuyang open shallow sea. (Original abstract)

Loucks R. G. and Kerans C. , 2003. Lower Cretaceous Glen Rose **"patch reef"** reservoir in the Chittim Field, Maverick County, south Texas. Transactions-Gulf Coast Association of Geological Societies 53: 490-503.

Biohermal buildups, or "patch reefs," have become an important play type in Maverick County in southwest Texas. Their primary method of discovery is by 3-D seismic analysis. The bioherms produce mainly gas and condensate. The porous biohermal section and associated facies are >70 feet thick and consist from the base upward of (1) burrowed, mud-dominated lime packstone that increases in grain content upward and includes fragmented and whole requienid rudists, (2) mud-rich lime packstone containing abundant whole requienids, stromatoporoids, corals, and a few caprinid rudists, (3) lime boundstone (bafflestone and bindstone) consisting of requienids, stromatoporoids, corals, Chondrodonta, rare caprinids, echinoid and mollusk fragments, and binding stromatoporoids and Lithocodium, and (4) coarse-grained lime grainstone (rudstone) that has the same components as the boundstone. The biohermal section has an average porosity of 9. 2% and an average permeability of 2. 9 md. The bioherms are found in the highstand systems tract of the lower Glen Rose high-frequency sequence (third-order-sequence 7 of Kerans and Loucks, 2003) within the longer term Glen Rose composite highstand sequence. It is anticipated that in this setting, strings of subparallel isolated buildups will be encountered rather than a continuous barrier that would be associated with a late highstand prograding system at the shelf margin. (Original abstract)

Mehrtens C. and Cuffey R. J. , 2003. Paleoecology of the Day Point Formation

(lower Chazy Group, Middle-Upper Ordovician) and its bryozoan reef mounds, northwest Vermont and adjacent New York. Northeastern Geology and Environmental Sciences 25(4): 313-329.

The stratigraphy of the Day Point Formation (Middle-Upper Ordovician Chazy Group) is complex, and shows lateral changes in lithology that produce sequences that are unique at different localities around the Champlain Valley. This unit contains bryozoan mounds or reefs built by Batostoma and Champlainopora species. In the lower portion of the formation, the bryozoan mounds and non-mound layers are often found on top of quartzose sand beds, or within the sand. In contrast, no sand is found in the upper Day Point, yet the bryozoan mounds also flourish. The Day Point Formation bryozoan reefs, especially the one exposed on Garden Island, NY are the geologically oldest in North America. They were built mostly by encrusting Batostoma Chazyensis and branching Champlainopora chazyensis, in differing vertical and lateral relationships, that had frame-building, sediment-binding, and sediment-forming roles. Nine additional bryozoan species which are taxonomically updated herein, functioned as minor accessories in the sedimentology of these build-ups. Six lithofacies that represent various lagoonal, bar/shoal, and subtidal environments are recognized in the Day Point. These include: (1) highly bioturbated sandstone with symmetrical and bifurcating ripples; (2) bioturbated, brachiopod-rich wackestone; (3) planar crossbedded, interlayered sandstone and sandy packstone; (4) interlayered sandstone and shale grading into sand and limestone layers; (5) grainstone, which at some localities, contains bryozoan mounds, and at other localities, thin non-mound sheet-like layers, and planar-laminated and cross-bedded packstone; (6) fine-grained calcareous sandstone with planar and herringbone cross-bedding, which in places contains small bryozoan mounds. This study has revealed more laterally discontinuous sand units in the lower portion of the Day Point Formation than noted by previous studies. There are repeated sequences of sandstone units succeeded by deeper water (subtidal, open shelf) carbonates in the Day Point, which we interpret to be a series of transgressive cycles. We hypothesize that

sedimentation of the sand stopped as a result of a rise in sea level within each cycle. The deeper water induced the accumulation of carbonate sediments, causing the water depth to decrease and allowed sand to accumulate again. Hydraulic variations may explain both the lithologic sequences and the faunal relationships observed in mounds within the Day Point Formation. The Day Point mounds are significantly different from Middle Ordovician bryozoan reefs described elsewhere in the Appalachians. They are older, contain a less diverse bryozoan fauna, and are smaller than bryozoan reefs in the Holston, Rockdell, and Carters Limestones. They are more similar in structure and composition to Middle Ordovician bryozoan mounds in Pennsylvania, Virginia, and Oklahoma, and indeed also resemble living Bahamian bryozoan reefs. (Original abstract)

Olivier N. et al. , 2003. Microbialite morphology, structure and growth; a model of the Upper Jurassic reefs of the Chay Peninsula (western France). Palaeogeography, Palaeoclimatology, Palaeoecology 193(3-4): 383-404. 2003.

During the Early Kimmeridgian, the northern margin of the Aquitaine Basin (Western France) is characterised by a significant development of coral reefs. The reef formation of the Chay Peninsula comprises two main reefal units, in which the microbial structures can contribute up to 70% of framework. The microbial crusts, which played an important role in the stabilisation and growth of the reef body, show the characteristic clotted aspect of thrombolitic microbialites. Corals are the main skeletal components of the build-ups. The bioconstructions of the Chay area are thus classified as coral-thrombolite reefs. Four main morpho-structural types of microbial crusts are distinguished: (1) pseudostalactitic microbialites on the roof of intra-reef palaeocaves; (2) mamillated microbialites, found either on the undersides or on the flanks of the bioherms; (3) reticular microbialites in marginal parts of the reefs and between adjacent bioconstructed units; and (4) interstitial microbialites in voids of bioclastic deposits. Thrombolitic crusts developed on various substrates such as

corals, bivalves, or bioclasts. The thrombolites formed a dense, clotted and/or micropeloidal microbial framework, in which macro- and micro-encrusters also occur. Variations in accumulation rate strongly influenced the reef morphology, in particular its relief above the sediment surface. The coalescence of the coral-microbialite patches created numerous intra-reef cavities of metre-scale dimensions. The direction of microbial growth, which defined the macroscopic microbialite forms, strongly depended on the position within the reef framework but was also controlled by water energy, accumulation rate and light availability. (Original abstract)

Ouyang R. , Jiao C. L. , Bai L. H. , Chang H. and Wang Y. C. , 2003. The distribution and features of reef in Tazhong Area of Tarim Basin, Northwest China. Petroleum exploration and development, 30（2）：33-36. (in Chinese)

There are many different kinds of reef in Tazhong Area of Tarim Basin, Northwest China in age of Medium-Upper Ordovician. The main reef-building organisms are sponges, calathium, stromatoporoids, corals, Crytalgaes, bryozoans, blue-green algae, chorophyte and rhodophyte in solenoporaceae. The reef can be divided onto calcilutite mound, framework reef and baffle reef. The analyzing on the reed encountered during the drilling shows that the calcitite mound is mainly formed in continental shelf are mainly in the shelf and the shelf margin. And by studying the sedimentary facies and the features of seismic reflection in this area, it can be predicted that reef with the distribution shapes of belt and discontinuous belt can be found in the shelf margin area of Tazhong Uplift and in the middle area of northern slope of Tazhong area. Especially, the areas at the west end of No. 1 fracture of Tazhong in west Shutuoguole block, up to now six anomaly reflection bodies have been found. Depending on the characters of environment and features of interior reflection they are very likely the reef mounds. It will have great effects on the oil and gas exploration of this area in

case of that more play would have been processed. (Original abstract)

Shen J. W. and Webb G. , 2004. Famennian (Upper Devonian) calcimicrobial (Renalcis) reef at Miaomen, Guilin, Guangxi, South China. Palaeogeography, Palaeoclimatology, Palaeoecology 204(3-4): 373-394.

Famennian (Upper Devonian) reefs represent a calcimicrobial and stromatolitic reef framework with a few skeleton-dominated (stromatoporoid) examples after the skeletal metazoans in reef ecosystems were impacted on a global scale by the Frasnian-Famennian extinction event. Calcimicrobes, thrombolites, stromatolites, and biologically induced cement formed the major part of reef framework volume and contributed to rigidity of reefs. In this study, one example of Famennian non-skeletal carbonate buildups at Miaomen, Guilin, South China, has been documented in detail. Thick and massive limestones in the platform margin facies show a lateral transition to well-bedded fenestral and laminated limestone in the back-reef facies southeastward and to well-bedded intraclastic grainstone, mudstone, and shale with lithoclasts and breccias in fore-reef slope facies northwestward. The Miaomen reef is almost exclusively constructed by calcimicrobes and cement. Major reef builders are Renalcis, Izhella, Paraepiphyton, Garwoodia, and a “Keega”-like microbe. Other reef builders are Wetheredella, Rivularia, Rothpletzella, Ortonella, and Girvanella. Some less common algae and calcimicrobes also occur in the Miaomen reef, including Parachaetetes, Solenopora, Tharama-like objects, and unidentifiable microbes. Cavities are well developed in the reef limestone. The Miaomen Renalcis reefs developed along leeward platform margin settings adjoined by intraplatform depressions and rimmed Famennian carbonate platforms along with stromatolite reefs, ooid shoals, brachiopod-shell shoals, nautiloid shoals, and previously described Renalcis-Epiphyton and Renalcis-cement reefs. Miaomen reefs demonstrate the significant roles of calcimicrobes and microbial carbonates in the development of Famennian carbonate systems in South China. Famennian

microbial reefs in Guilin represent an interval of profound biotic change in the style and extent of carbonate buildups and in the composition of buildup communities and indicate important environmental and ecological changes within the carbonate system. (Original abstract)

Soja C. M. , Mitchell M. , Newton A. J. , Vendetti J. , Visaggi C. , Antoshkina A. I. and White B. , 2003. Paleoecology of sponge-Phydroid associations in Silurian microbial reefs. Palaios18(3): 225-235.

Microbial boundstones from Alaska and Russia yield new insights into the paleoecology of Silurian biotas that inhabited stromatolite reefs. These high-energy reefs were built along the Uralian Seaway in the Late Silurian by a diverse suite of microorganisms in association with accessory metazoans, predominantly sphinctozoan sponges. Within the stromatolite framework, three species of small, solitary, sphinctozoans (aphrosalpingids) encrusted a variety of hard substrates, mostly skeletal remains but also microbial laminae and cavity surfaces. Fossils encrusted by the sponges include the problematic hydroid *Fistulella*, possible stromatoporoids (recrystallized), crinoids, the possible cyanobacterium *Ludlovia*, corals, and unidentifiable shelly debris. In addition to the ubiquitous microbial laminae, the sponges, *Fistulella*, and ?stromatoporoids were less commonly encrusted by *Ludlovia*, Renalcis, or crinoids. Well-developed attachment surfaces, including enlarged holdfasts, allowed the sponges to achieve stability on the seafloor after larvae settled randomly on available hard surfaces. A greater incidence of sponge encrustations on *Fistulella* than on other organisms indicates that some of the sponges may have enjoyed a commensalistic relationship while attached as juveniles to a living substrate. The sponges' orientation on *Fistulella* in the sediment suggests that the relationship between the two taxa may have become parasitic, whereby the weight of the sponges caused Fistulella to collapse into the muddy substrate. Recognition of the intimate growth relationships shared by Silurian sphinctozoans, *Fistulella*, and other organisms expands the fossil record of encrusting sponges, identifies a novel

sponge-Phydroid association, and reveals organismal responses to competition for space in mid-Paleozoic microbial reefs. (Original abstract)

Sugiyama T. , Fujisi H. , Taguchi S. and Nagai K. , 2003. Occurrence and origin of euhedral crystals of quartz in the Akiyoshi organic reef limestones. Bulletin of the Akiyoshi-Dai Museum of Natural History 38: 1-21.

Abundant euhedral crystals of quartz were found in reef limestones from seven localities in the Akiyoshi Limestone area. Quartz crystals occurred in grainstone with an average length of 0. 261 mm and width of 0. 121 mm, and the average ratio between length and width is 2. 149, which means the quartz crystallized in elongate shape under a hydrothermal environment. The quartz crystals have different size distributions and inside structures among their host limestone textures. Large crystals grew up in trabecula tissue of reef building organisms, such as rugose corals and chaetetids, and small ones in micritic matrix or coated grains. It might depend on density of fine clucks and solubility to the hydrothermal liquid in each host limestone texture. Quartz usually has solid calcite inclusions as inside layers. These solid inclusions come from remains of host calcite tissues which unsolved during crystallization in hydrothermal liquid. Mineralogical identification of inside layers of quartz was done by the laser Raman microprobe. Homogenization temperatures of primary fluid inclusions in quartz veins (from 150-220℃) and a calcite vein (169. 5℃) talked that the origin of these euhedral crystals of quartz came from a hydrothermal activity which possibly occurred in Late Cretaceous after the intrusion of quartz porphyry in the Akiyoshi Limestone area. (Original abstract)

Weidlich O. , Kiessling W. and Fluegel E. , 2003. Permian-Triassic boundary interval as a model for forcing marine ecosystem collapse by long-term atmospheric oxygen drop. Geology (Boulder) 31(11): 961-964.

Ecological traits of reefs across the Permian-Triassic boundary interval coincide

with a modeled decline of atmospheric oxygen throughout the Permian Period. Selective extinction and recovery patterns within the reef system are observed both at the end of the middle Permian (end-Guadalupian) and at the Permian-Triassic boundary. The end-Guadalupian event selectively affected corals and broke down the cool-water carbonate factory. Sponges, however, were largely unaffected and bloomed in reefs toward the end of the Permian. The end-Permian total destruction of the metazoan reef system only left behind poorly diverse microbial communities. The temporal reef patterns are thus similar to spatial patterns of modern benthic communities approaching oxygen minimum zones. This observation suggests that a decline in oxygen concentrations was at least partly involved in the destruction of reefs, even where there is no direct evidence of oceanic anoxia. (Original abstract)

Wild Chr. , Huettel M. , Klueter A. , Kremb St. G. , Rasheed M. Y. M. & Jogensen Bo. B. , 2004. Coral mucus functions as en energy carrier and particle trap in the reef ecossystem. -Letter to Nature 428. -[www. nature. com/nature]

Zooxanthellae, endosymbiontic algae of reef-building corals, substantially contribute to the high gross primary production of coral reefs, but corals exude up to half of the carbon assimilated by their zooxanthellae as mucus. Here we show that released coral mucus efficiently traps organic matter from the water column and rapidly carries energy and nutrients to the reef lagoon sediment, which acts as a biocatalytic mineralizing filter. In the Great Barrier Reef, the dominant genus of hard corals, Acropora, exudes up to 4, 8 litres of mucus per square metre of reef area per day. Between 56% and 80% of this mucus dissolves in the reef water, which is filtered through the lagoon sands. Here, coral mucus is degraded at a turnover rate of at least 7% per hour. Detached undissolved mucus traps suspended particles, increasing its initial organic carbon and nitrogene content by three orders of magnitude within 2 h. Tidal currents concentrate these mucus aggregates into lagoon, where they rapidly settle. Coral mucus provides light energy harvested by zooxanthellae and trapped particles to the heterotrophic reef

community, thereby establishing a recycling loop that supports benthic life, while reducing loss of energy and nutrients from the reef ecosystem. [original abstract]

Wood R. , 2004. Palaeoecology of a post-extinction reef: Famennian (Late Devonian) of the Canning Basin, north-western Australia. Palaeontology 47 (2), 415-445.

Reefs were decimated by the Frasnian/Famennian (Late Devonian) mass extinction event (371 Ma) and are assumed to have survived only as depauperate calcimicrobial communities dominated by disaster taxa. Descriptions of Famennian proximal reef-slope communities within the Windjana Limestone, Canning Basin, north-western Australia, show that, notwithstanding the loss of large metazoans, novel ecologies were established in this setting by a rich biota of survivor and progenitor taxa. Diverse calcimicrobes, together with algae, crinoid, bryozoans, brachiopods and abundant sponges (stromatoporoids, inozoans, sphinctozoans, lithistids and hexactinellids) formed a reef framework of either elevated platy structures up to 4 m in diameter and 0. 35 m thick, or mounds up to 15 m in diameter. This framework was dominated by a complex intergrowth of calcimicrobes where Rothpletzella formed the primary framework, Ortonella and Girvanella were secondary encrusters , and Shuguria spp. occupied small crypts 2-30 mm in diameter. Contiguous columnar stromatolites up to 50 mm in height and 1 m in width grew upwards from substrate sheltered beneath large sheltered primary cavities: based on minimum growth rates of 50-100 ?m/year these are estimated to have been 500-1000 years old. The elevated platy community is inferred to have grown in conditions of episodic siliciclastic sediment input; the reef mounds grew during either episodes, or in localized areas, of low sedimentation. At least 14 species of spicular sponges are now identified from the Windjana Limestone where only two were previously documented. These fore-slope reef communities exposed in Windjana Gorge flourished in high energy carbonate environments dominated by coated grain sediments and, where rapid, early lithification was pervasive.

Such observations demonstrate that no protracted interval of time was necessarily required for ‘ post-extinction recovery ’ in regions where some reef-building taxa survived and suitable carbonate habitats persisted or returned. Moreover, they show that new ecologies, rather than remnants of the pre-extinction community, could be established rapidly. The reef-slope communities of the Windjana Limestone offer little evidence to support the ideas of resurgence or invasion of taxa from deeper waters after the Frasnian/Famennian extinction event. Indeed, there is evidence to suggest that similar microbial-sponge communities were already established in margin and reef slope communities in the latest Frasnian. As such, the most dramatic ecological changes caused by the extinction occurred in back-reef communities. [original abstract]

Wu Y. S. , Fan J. S. and Jin Y. G. , 2003. Emergence of the Late Permian Changhsingian reefs at the end of the Permian. Acta Geologica Sinica 77(3): 289-296. (in Chinese with English abstract)

Dolostones occur on the top of the reef core, reef front and back reef sequences of the Upper Permian. The Changhsingian reef in Ziyun County, Guizhou Province, southwestern China. Comprehensive study on them reveals that these dolostones are of the supratidal Sabkha genesis: (1) All have δ 18O values higher than those of their precursor limestones, (2) All have Sr and Fe contents similar to those of know typical supratidal Sabkha evaporative finely crystalline dolostones from a well in the Ordos Basin, Shaanxi-Gansu-Ningxia provinces,China, (3) All are composed of finely crystalline euhedral-subhedral dolomites, (4) All occur on the top of reef core, reef front and black reef, (5) Algal laminated structure, bird-eyes, mudcracks and crustose limonite occur in the reef front and black reef. These features indicate that this reef was once emerged at the terminal Permian. The emergence of the Changhsingian reefs at the terminal Permian might be caused by sea-level drop. This inference is in agreement with the sedimentary environmental changes in China and North Italy. The Cadore Basin in North Italy changed from a mid-shelf environment to a meteoric phreatic diagenetic environment at the end

of the Permian. During the Permian-Triassic transition, the water depth of the Lower Yangtze Basin changed from more than 1000 meter(below the carconate compensation depth) to less than 1000 meter(near the carbonate compensation depth). The sea-level drop indicated by evidence from not only reefs but also non-reef deposits might be one aspect of the mechanism that caused the mass extinction of biota at the end of Permian. (Original abstract)

Yang Z. Y. and Liu Z. H. , 2003. Inozoan, Major Reef frame-building organisms in Late Permian, Hunan. Oil & Gas Geology, 24(1), 70-74. (in Chinese with English abstract)

The late Permian reefs are distributed in Chengxian, Guiyang and Chenxi Counties in southern Hunan province. Reefs in Bangxian and Guiyang are patch reefs developed along Chengru shallow sea. Reefs in Chenxi are bioherms, undeveloped patch reefs. The reefs in both sites occur in the late Permian Changxing Formation. A lot of samples of fossils and rocks have been collected while surveying 8 reef composite sections in southern Hunan. We find that the most important frame-building organisms are calcisponges, just as other Permian reefs in southern China. By systematically researching Inozoans, one of the important frame-building calcisponges, it is thought that the water system and fibres might be important evidence in classification. Twelve species and 8 genera of Inozoans including one new species, one comparative species and one undefined species are found, and some species are newly classified. (Original abstract)

Announcement

Annual Membership Fee

Money Transfer Policy and Form

(1)The association suggests 10 Euro as an annual membership fee.

(2)We will accept your payment by credit card, VISA or Master card, because of the lower handle charge. Please write your name and card number in standing form as a typing quality. **There were some transfer troubles already caused by poor handwriting information!!**

(3)The treasurer made a contract with a Japanese travel agency, **Kinki Nippon Tourist, Ltd.** They will withdraw your payment from your card account as the annual fee of the Fossil Cnidaria & Porifera Association along with the current exchange rate between Euro and Japanese Yen. This system will start on Jan. 5, 2004.

(4)**The treasurer will welcome a whole amount of annual fees in each area accumulated by the correspondent**. Individual payment will be also acceptable.

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