

GeoBioChatter

Newsletter of the Geobiology & Geomicrobiology Division of GSA

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September 2010

Chair's Corner

The next GSA meeting Denver, CO, is coming up! It will be again a spectacular event, where 17 (!) topical sessions sponsored by our division represent geobiology and geomicrobiology in all its beautiful facets. Highlight will be the Pardee Keynote Symposium in honor of the 50th Anniversary of NASA Exobiology, as here summarized by Linda Billings.

However, there are also sad news. Kath Gray remembers Hans Hofmann †.

This GeoBioChatter issue further highlights the activities of our geobiological colleagues in China, where the First International Conference Geobiology took place this year.

A note by Jere Lipps underlines the significance of geoparks to preserve geologically significant outcrops.

Lastly, my turn as Chair of the GSA Division GBGM is over. I would like to thank you all for the privilege to serve this lively community. For their immense support during the past 4 years, I owe thanks to secretary Jim Schiffbauer, treasurer Wenying Wu, and to past chairs Stuart Birnbaum and Jack Farmer. My thanks go also to vice chair Frank Corsetti, who from the coming business meeting on will take over the lead.

Good luck!

Nora Noffke

NOTE !! To encourage the next generation of geobioscientists we will again award prizes to the best student posters presented at the meeting in Denver. Please step forward to volunteer as judge for this delightful job. Just drop me a note by e-mail. Nora Noffke

International Conference of Geobiology at Wuhan, China

By Shucheng Xie

The international conference of geobiology was successfully held at Wuhan, Central China, on 3-6th June, 2010. This conference aims to enhance the international exchange in geological research and to promote interdisciplinary integration of geosciences with life science. Subject of the conference is the co-evolution between life and environments at the critical periods of geological history. The Wuhan conference, believed to be one of the earliest on geobiology in China, was echoed by a submission of more than one hundred abstracts, and attracted the attendance of over 160 geoscientists from 18 countries.



Geobiology eminence in the front row:

Roger Summons and David Bottjer framed by honorable members of the Chinese Academy of Sciences

The conference is organized and hosted by Key Laboratory of Biogeology and Environmental Geology of Ministry of Education at Wuhan, in collaboration with State Key Laboratory of Modern Paleontology and Stratigraphy, State Key Laboratory of Geological Processes and Mineral Resources, Key Laboratory of Evolutionary Systematics of Vertebrates, and the International Association of Geomorphologists (IAG).

Eight sessions were included, covering a large part of geobiology issues; they are early life and earth environments, Early Paleozoic explosions, crises and their geological background, geo- and bio-events during the Late Paleozoic, Mesozoic and Cenozoic extinctions, radiations and environmental changes, Quaternary global change and geoaerchaeology, geomicrobiology and its implications for resources and environments, astrobiology and life under extreme environments, and IGCP 572 special session of Permian-Triassic ecosystems.

Each symposium is convened by leading experts in the respective area from the world, and guided by keynote speeches. Some exciting parts of the meeting concern with the geo-stable molecules as oxygenation proxies, carbon and nitrogen cycling, rise of cyanobacteria and the MISS representing microbial activities in the session of early life and its environment. Significant topics on Paleozoic life and environment concerns the explosions and crises of various taxonomic groups including invertebrates, plants, trace fossils and microfossils, and their geological background covering a vast expanse of paleogeographic regions from Asia, North America, Europe and Africa. Permian-Triassic mass extinction and recovery continued to be a hot point of geo-bio-interaction, e.g. extinction and recovery of vertebrate faunas and marine ecosystems, the Permian radiolarian evolution, and the discoveries of Anisian Luoping biota. The change of 400ka-periodic carbon cycle caused by marine microorganism function, peatland carbon dynamics, prehistoric settlements and Neolithic agriculture highlighted the Quaternary topic. The microbial roles in mineral formation, dissolution, alteration as well as pedogenesis via redox reaction are included in geomicrobiology session.

Two post-conference field excursions were designed. The excursion to Guangxi in South China visits the Middle-Upper Devonian sequence with apparent F-F extinction boundary, and the Permian-Triassic deepwater sequence. The excursion to Guizhou, SW China shows the end-Permian marine ecosystem collapse and Early Triassic ecosystem's recovery and biotic radiation.

The large number of participants and the wide covering range of the scientific sessions render us to believe that this first international meeting in China on geobiology is a true success, and will definitely continue in the future.

GSA Denver 2010 - Pardee Keynote Symposium: “Exploring for Life in the Cosmos: Celebrating Five Decades of Astrobiology”



At this year's Annual National meeting in Denver, the Geobiology & Geomicrobiology Division of GSA will sponsor Pardee Keynote Symposium 8, entitled: “Exploring for Life in the Cosmos: Celebrating Five Decades of Astrobiology”. This session will celebrate more than five decades of Astrobiology as a scientific discipline.

As a term, Astrobiology was first coined in the 1940s to encompass early scientific ideas about how to explore for extraterrestrial life (Dick, S.J. and Strick. J.E., 2004. [The Living Universe: NASA and the Development of Astrobiology](#). New Brunswick, New Jersey: Rutgers University Press). More recently, Astrobiology has been defined as the scientific discipline that studies the origin, distribution and future of life in the Cosmos. Over the past five decades, it has evolved to be a highly interdisciplinary field that seeks answers to some of humankind's most basic questions, including: How did life originate? Are we alone in the Universe?

Highlighted in the session outline below, Pardee 8 speakers and topics will include many of the scientists and key discoveries that have helped define the development of the field of Astrobiology in recent decades. All GMGB members are encouraged to attend the session, which will be held in the afternoon on Tuesday, November 2. - ***Jack D. Farmer, Pardee Symposium Chair***

Pardee Keynote Symposium Program

- Dr. G. Scott Hubbard (Stanford University): “The historical roots of Astrobiology”
- Dr. Carl Pilcher Director (NASA Astrobiology Institute): “Creating a new field: The NASA Astrobiology Institute”
- David Deamer (UC Santa Cruz): “Origins of life”
- John Baross (University of Washington): “Limits if life, early evolution and the search for habitable planets”
- David Des Marais (NASA Ames Research Center): “The new Mars: Astrobiology of a neighbor planet”
- Richard Greenberg (University of Arizona): “Europa”
- Ralph Lorenz (Johns Hopkins University Applied Physics Lab): “Titan and Enceladus: Icy cauldrons of organic synthesis”
- Paul Butler (Carnegie Institution of Washington): “A brief history of extrasolar planet research”

*GSA Division Geobiology and Geomicrobiology
Award for Outstanding Contributions to Geobiosciences 2010*



from left to right:

John P. Grotzinger

for his service as lead scientist NASA Mars Rover Mission

H. Richard Lane

for his service as co-founder of the GSA GBGM Division

Nora Noffke

for her service as chair to the GBGM Division and as founder of the GRC Geobiology

50 Years of Exobiology and Astrobiology at NASA

This year, the U.S. National Aeronautics and Space Administration (NASA) is celebrating the 50th anniversary of its Exobiology Program, which was formally established in 1960. In 1959, just a year after its formation, NASA funded its first exobiology investigation, an extraterrestrial-life-detection experiment intended for launch on the Viking mission to Mars. While this investigation ultimately did not fly on the mission, it did help to kick-start exobiology at NASA.

By the 1980s NASA expanded its exobiology program to encompass studies of evolutionary biology. In the 1990s, NASA again expanded the program to establish

Astrobiology as a program encompassing studies of chemical evolution in interstellar space, the formation and evolution of planets, and the natural history of Earth in addition to exobiology and evolutionary biology. Astrobiology is now a program of the Planetary Science Division in NASA's Science Mission Directorate (SMD).

Early managers of the Exobiology Program adopted an approach to advancing this field of study by funding forward-thinking, boundary-bending, multidisciplinary research projects that other research funding organizations tended to judge as too risky. Later managers of the program maintained this approach, which continues today.

Astrobiology today

Astrobiology is the study of the origin, evolution, distribution, and future of life in the universe. It is a multidisciplinary field of research, drawing on knowledge and expertise in astronomy, biology (particularly microbiology and evolutionary biology), chemistry, earth and planetary sciences, physics and many hybrid or sub-disciplines. Astrobiology also involves studies in the humanities (primarily philosophy and theology) and social sciences.

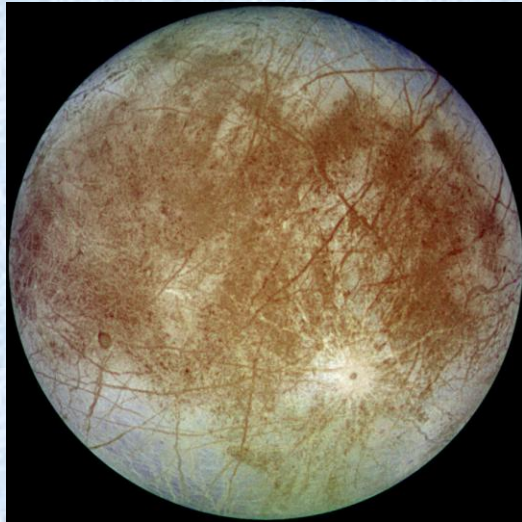
Research funded by NASA's Astrobiology Program addresses three fundamental questions: How does life begin and evolve? Is there life beyond Earth and, if so, how can we detect it? What is the future of life on Earth and in the universe? The Astrobiology Program has five elements: Exobiology and Evolutionary Biology, Astrobiology Science and Technology Instrument Development, Astrobiology Science and Technology for Exploring Planets, Astrobiology Small Payloads, and the "virtual" NASA Astrobiology Institute (NAI), which funds distributed teams of researchers collaborating on common scientific questions. The Astrobiology Program is guided by a community-generated roadmap of goals and objectives that is updated approximately every five years. Much of the research supported by Astrobiology contributes directly to planetary exploration missions.

The term "astrobiology" was officially established in the lexicon of space science in the mid-1990s when NASA established its Astrobiology Program. The term is not new, however, nor is the science encompassed by the field. The idea that life might exist beyond Earth is thousands of years old. The idea of searching for evidence of extraterrestrial life is as old as the Space Age, and scientific study of the origin, evolution, and distribution of life in the universe was well under way before NASA was established in 1958. NASA's Viking missions to Mars, launched in 1976, included three

exobiology experiments designed to look for evidence of life on that planet. The scientific consensus was, and still is, that those experiments did not yield any evidence of biological activity on Mars. Nonetheless, thanks to advances in understanding the origin and evolution of planetary environments and life, Mars is a primary focus of astrobiology today.

The science of astrobiology

Since the formal establishment of the NASA Astrobiology Program in the '90s, the field of astrobiology has grown rapidly, and the possibility of extraterrestrial life has become a



serious scientific question. Recent research findings that are relevant to astrobiology include evidence of past and perhaps even present liquid water on Mars, an ice-covered liquid water ocean on Europa, the discovery of hundreds of extrasolar planets, plumes of water-ice particles erupting from Saturn's moon Enceladus, the possibility of liquid water beneath the surface of Titan, and identification of new forms of microbial life in an ever-widening range of extreme Earth environments. Mars is now considered the best – though not the only – place to look for evidence of

extraterrestrial life, past or present, in our solar system. In 2011, NASA plans to launch its first dedicated astrobiology mission to Mars since Viking – the Mars Science Laboratory, a multi-billion-dollar lander/rover that will continue the search for past or present habitability on Mars.

Australia, Canada, France, Germany, India, Russia, Spain, and the United Kingdom are among a growing number of nations that are funding astrobiology research, and international collaborations in astrobiology are common. Field sites for astrobiology research have ranged from Antarctica to Alaska, Australia, Canada, Chile, China, Mexico, Norway, and Hawai'i, as well as elsewhere in the continental United States.

The Future

To mark the 50th anniversary of Exobiology, the NASA Astrobiology Program will hold a symposium, free and open to the public, on October 14 in the Washington, D.C., area. Opening keynote speakers will be two of NASA's earliest Exobiology principal

investigators, Lynn Margulis and James Lovelock. Stay tuned to the program's web site (*see below*) for information about registration and Webcasting.

It is impossible to predict what astrobiologists will know about the origin, evolution, distribution, and future of life in the universe when the time comes to celebrate the 100th anniversary of exobiology and astrobiology. But it is reasonable to expect that it will be unexpected.

For more information on NASA's Astrobiology Program, see:
<http://astrobiology.nasa.gov>.

Linda Billings

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Principal Investigator, NASA Astrobiology Program
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In Memory of

HANS J. HOFMANN

1936-2010

Paleontologist Hans Hofmann died in his sleep of a heart attack at his Montreal home on Wednesday, May 19, 2010, aged 73.

Hans was world-renowned for his pioneering discoveries of Precambrian fossils and studies of early evolution. His website summarized his research as being 'devoted to the study of early life on Earth, its evolution, the significance of an evolving biosphere in relation to the development of the other geospheres (hydrosphere, atmosphere, and lithosphere), and the major divisions of geologic time.' The last referred to his strong interest in the theoretical side of Precambrian time subdivision and his introduction of the Geon concept, which he first presented in a paper in *Geology* in 1990. His paleontological interests centred around 'microbial fossils (bacteria, cyanobacteria, acritarchs), megascopic fossils (algae, primitive metazoans, remains of enigmatic affinities), biosedimentary structures (stromatolites and trace fossils), and structures of dubious biogenicity (dubiofossils).' He introduced the classification of Precambrian structures as 'fossils, pseudofossils or dubiofossils', an approach that has helped many paleobiologists wrestling with the question of whether structures were biogenic or abiogenic. His pioneering work using computers for analyzing and simulating fossil morphology will continue to play a major role in

interpreting the record of early life and will provide guiding principles for interpreting possible remains of extraterrestrial life.

His contribution to Canadian geology was immense. He discovered 2-billion year old microfossils in Hudson Bay, 650-million year old fossils in the Northwest Territories, and other significant fossils in Newfoundland, Ontario, northern Quebec and the northern Rockies. He was one of the few western paleontologists to treat stromatolites taxonomically and played a leading role in the discovery of some of the oldest known fossil stromatolites in Australia. He published several inventories of Canadian Precambrian fossils. During his career, Hans published more than 100 scientific papers, and he was a tireless presenter at international conferences and won several distinguished prizes. He was an accomplished linguist and held a pilot's license. He was a meticulous worker and brought rigour to a field renowned for headline-grabbing but often short-lived discoveries.

Hans J. Hofmann was born in Kiel in northern Germany on October 3, 1936, and he developed a love of natural history and the outdoors when his family moved to Eschenrod, a village near the Main River, to escape bombing during the Second World War. After the war, Hans's father, Willi, emigrated to Canada. The family eventually reunited in Montreal in 1952. Hans attended Rosemount High School, and after overcoming the problem of having to study in English, earned a scholarship to McGill University in 1954. He obtained a BSc in geology in 1958 and won the Logan Gold Medal for an undergraduate with "an excellent academic standing". He went on to earn both Masters and PhD degrees at McGill University.

In the 1960s, Hans was appointed professor at the University of Cincinnati, where he taught a course on Precambrian geology and Precambrian life that stimulated his interest in a field that was to become his lifetime's work. Unable to obtain a green card, Hans returned to Canada and began working for the Geological Survey of Canada. In 1969, he published 'Attributes of Stromatolites', which is still a major reference for any student of that group of fossils. He became interested in the morphometrics of stromatolites and devised a new approach to 3D reconstruction. In 1969, he became a professor in the geology department of the Université de Montréal, a post he held for 31 years.

In the late 1970s, Hans joined the Precambrian Paleobiology Research Group founded by Bill Schopf at UCLA to examine the evidence for Archean life. Hans continued his collaboration with members of the PPRG team throughout his career and joined the second PPRG of the late 1980s, which focused on Proterozoic life. He received the Billings Medal from the Geological Association of Canada in 1980 and one of Hans's stromatolites was commemorated by a 39-cent postage stamp in 1990. In 1995, he was awarded the Willet Green Miller medal of the Royal Society of Canada for "outstanding research in any field of the earth sciences." In 2002, was awarded the Charles Doolittle Walcott medal of the U.S. National Academy of Science for

outstanding “individual achievement in advancing knowledge of Precambrian life and its history’, a singular honour for a Canadian.

As one of Hans’s few colleagues still actively working on stromatolites, I owe him much for his early work on characterizing the structures and I spent many happy hours with him looking at them on field trips in China, Mauritania, and the Northern Territory of Australia. Many of the principal stromatolite researchers of those days were on the trip to Mauritania in 1988. One of the spectacular outcrops we visited was littered with shrapnel after being used for target practice by the Mauritanian army. Hans worried that we might strike something unexploded in our



enthusiasm for collecting the superb material at the outcrop, and I remember him pointing out that we needed to be very careful not to wipe out about 80% of the world's expertise on stromatolites by a misdirected hammer blow.

**Famous stromatolite heads:
Hans Hofmann (center) joking with
Malcolm Walter (left) and Martin
van Kronendonk (right). Photo by
Kath Grey**

In the late 1990s, Hans and I conducted a vigorous email debate about whether large conical structures at the Trendall outcrop in the northern Pilbara were biogenic or not. He had been shown photos of metre-high specimens in the 3430 million year old Strelley Pool Formation by Ralph Thorpe and Alec Trendall, and was convinced they were stromatolitic. I was less certain. I had made a brief visit to the outcrop in 1984 (although not, as it turned out, to the critical face) and what I had seen suggested to me that the structures were enterolithic gypsum. Eventually Hans got enough funding to come to Western Australia, and in 1997, he, Arthur Hickman, and myself spent a couple of weeks visiting or revisiting all the then known sites thought to have evidence of early life.

Hans and I were very much in agreement about the criteria we found acceptable as evidence for biogenic structures, but although we found the morphologies we saw at many localities convincing because of our familiarity with three-dimensional parameters of stromatolites, we did not find a complete complement of features until we reached the Trendall site. We agreed that the metre high, inverted V-shaped structures we saw there were indeed conical stromatolites and

biogenic, but realized it would be difficult to persuade our peers of this because only the vertical profile was visible. Eventually, we found the small, three-dimensional conical stromatolites that became known as the 'egg cartons', and realized that we had found exactly what we had been looking for. Once we had removed an overlying slab, we exposed a spectacular bedding plane surface, covered with small, well preserved cones. The slab is now displayed in the Western Australian Museum. I can remember the three of us sitting on the adjacent rocks for a good half hour staring at the face and taking it in turn to mutter 'It's amazing'. It took a further two years before we were ready to publish the discovery in the Geological Society of America Bulletin and to organize a field excursion to show them off. Despite all the subsequent controversy, neither Hans nor I wavered from our original interpretation of the structures, and I treasure the memory of working with him on the project.

Hans's opportunities to pursue studies of the Trendall stromatolites were curtailed in 2000, when the University of Montreal's Geology Department closed, leaving him without funding to return to Australia. He became an adjunct professor at McGill University and researcher at the Redpath Museum, where he was still an active researcher at the time of his death.

I will miss Hans. I did not see much of him in later years, although we corresponded and I managed to catch up at UCLA at the 2008 World Summit on Ancient Microscopic Fossils. Apart from his significant contribution to the scientific record of the evolution of life, Hans was always stimulating to work with. He often surprised his colleagues by his somewhat different take on things and the way he linked paleontology to other developments in science. I remember him pointing out that stromatolites were fractals at a time when only a select band of mathematicians knew what fractals were. I also got caught by his wry, sometimes quirky sense of humour more times than I care to remember. He would announce some preposterous idea in such a serious tone that I would fall for it; at least until I learnt to recognise from the twinkle in his eye that I was being teased.

Hans's death is a great loss to paleontology and to the world of scientific research. He will be remembered for his passion for geology and outstanding contribution to Precambrian paleobiology, and his enthusiasm for working in remote areas. He leaves a wife, Eva, daughter Wendy and son Thomas, and grandson Noah. He will also be greatly missed by his extended family, and friends and colleagues in the scientific community.

Kath Grey
Chief Paleontologist
Geological Survey of Western Australia, Department of Mines and Petroleum, Perth WA 6004

The Significance of Geoparks – an Initiative by Jere Lipps

For paleontologists and sedimentary geologists, our field sites and specimens are our most valuable resources. They provide data that is essential to the sound interpretation of ancient life and that cannot be obtained in any other way. Such data constitutes a continuing need, as new information, interpretations and studies require additional examination of the original materials. We know this is true for fossils preserved in museums, and we have institutional ways to deal with their preservation. For field sites, the International Paleontological Association's new initiative, PaleoParks, aims to provide identification, protection and conservation of important sites world wide. IPA is compiling a database that will list all sites, including those already protected in National Parks, World Heritage Sites, and GeoParks, among others. It will also list smaller and private sites in an attempt to tabulate all such sites world wide. Each PaleoPark will be identified with its particular values--research, education or recreation/tourism. Well-protected sites will be listed on-line for people who wish to visit or need information about them. Those without proper protection protocols will remain on the database but not be accessible to everyone. More needs to be done.

The IPA has held four workshops on this topic (IGC 32, Florence; IGC 33, Oslo; IPC 2, Beijing; IPC 3, London) that included paleontologists, geologists or other interested persons (land-use, parks, government) who may have ideas about the protection and safe utilization of these precious resources. IPA is especially interested in the development of a network of paleontologists and others who are concerned with the preservation of their local, national or international sites. Right now IPA has a working web site for PaleoParks (<http://ipa.geo.ku.edu:591/paleoparks/>) where sites can be entered for consideration for IPA protection as a PaleoPark. IPA will support local efforts to protect and preserve these sites. IPA expects that different regions and countries will be sufficiently variable in these kinds of aims that we will need advice on how to proceed and what the criteria for preservation should be.

The IPA published a free, on-line e-book *PaleoParks - The protection and conservation of fossil sites worldwide* (http://paleopolis.rediris.es/cg/CG2009_BOOK_03/) and a second volume is planned for the near future. Potential authors are urged to contact Jere Lipps (below).

Comments and suggestions are welcome; please send them to Jere Lipps, IPA Delegate for PaleoParks

jlipps@berkeley.edu.

For further information and to nominate a fossil site, visit the International Paleontological Association PaleoParks on-line: <http://ipa.geo.ku.edu:591/paleoparks/> . Help the International Paleontological Association's efforts to protect fossil sites world-wide and the data that they still contain.

SEPM-Field Conference on Sandy Microbial Mats from the Archean to Today, Denver, Colorado, USA, May 2010

The fossil record of Earth's early life is highly encrypted. Rocks of ages beyond 3 billion years have experienced so severe an overprint by tectonics, metamorphism, and weathering that any indication of former presence of life is faint. However, geobiologists bridge the gap that time has eroded into the rock record. Geobiologists study modern microbial mats to have handy information for the interpretation of world's most antique rocks. Research of the past decade has shown that modern microbial mats are mostly identical to ancient ones. Therefore they constitute valuable models to understand the evolution of prokaryotes in the Archean time. With an age of 3.2 Ga, benthic, microbial mat-forming microorganisms developed the oldest ecosystems in Earth history. Only stromatolites top this age by another 200 or 300 million years.

The 45°-dipping Dakota sandstone beds contain exceptional microbial mats, but must be climbed carefully.



The SEPM field conference in Denver was devoted to sedimentary structures caused by microbial mats in sandy settings. Now known as MISS – microbially induced sedimentary structures – these mats have been studied intensively for just a few decades. At the recent meeting, pioneer workers like David Bottjer, Richard Castenholz, and Jim Gehling gave highly spirited insights into the development of a research field that has its origin in the classical Senckenberg school in Germany. This school defined actualistic paleontology and sedimentology. Gisela Gerdes and Wolfie Krumbein, geomicrobiologists in Oldenburg, Germany, produced a booklet in 1987 that still serves as an excellent introduction for interested readers. About the same time Wolfie Krumbein organized the 'Mini Microbial Mat Meetings' in Oldenburg, interdisciplinary conferences that assembled geo- and bioscientists to explore Earth's oldest and most extreme environments. The volume 14 of the journal PALAIOS, edited by

David Bottjer, Whitey Hagadorn and Frieder Pflueger in 1999, was the first multi-author forum that shed light on microbial mats in siliciclastic environments.



Patrick "Paddy" Friend specializes in biostabilization of modern microbial mats. Here he reconstructs the ancient current velocity from the surface sculpture of a fossil, endobenthic microbial mat.

The research field of siliciclastic microbial mats received a nice decorative element with the beautiful 2007 atlas by Juergen Schieber, Pat Eriksson, Wlady Alterman, and their colleagues. Perhaps my own recent textbook will contribute to the field as well. Actualistic paleontology and sedimentology is not only road for microbial mat research.

Dolf Seilacher, Renata Netto, Luis Buatois, and other leading ichnologists know about the usefulness of investigations in modern tidal flats to reconstruct the in the fossil record often bizarre traces of long-gone organisms.

The interest that started at the Mini Mat Meetings in Oldenburg, has now engaged the sedimentological and paleontological community worldwide. Not less than 50 working groups from 17 nations participated the SEPM conference in May – a truly international convention.



"Did you find a Dickinsonia?" asks a concerned Luis Buatois (center) the Australian Ediacara expert Jim Gehling (left). "These are all paleosols!" interrupts Greg Retallack (right).

The highlight of this conference was the trip to Dinosaur Ridge, at the well known outcrop along Alameda Avenue in Denver. This outcrop displays tidal flat sandstones of Cretaceous

age. Although this site is famous for its dinosaur footprints, many significant microbial mats covered the tidal flat surfaces. Fifty scientists released into the 46 m thick sandstone succession gave rise to 50 different interpretations of what is recorded. Heated debates argued whether the microbial mats would be just erosional remains of sediment layers, or paleosols, or muddy lagoon fillings. In the end all were happy to have discussed this out, and agreed that this conference must be repeated often. The next opportunity is already in place - the new Gordon Research Conference 'Geobiology' (program on next page).

Hank Chafetz and I thank SEPM and the NASA Astrobiology Institute NAI for their valuable support that made this conference possible.

Nora Noffke

Noffke, N. (2010): *Microbial mats in sandy deposits from the Archean Era to Today*. Springer, Heidelberg, 193p.

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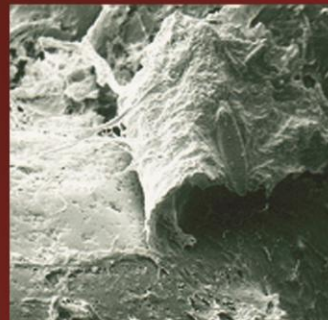
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Gordon Research Conference on Geobiology

January 30 - February 4, 2011
Ventura Beach Marriott
Ventura, California, USA

Chair: **Nora Noffke** Vice Chair: **John Stolz**

Geobiology studies Earth as a system, and explores the past, present and future of the interaction of life with its environment. The new GRC will discuss the latest research highlights and will invite exciting case studies that demonstrate the potential of this interdisciplinary research field. The inaugural meeting links studies of modern and ancient microbial ecosystems in order to understand the evolution of early life on Earth. It focuses on environments represented in Hadean and Archean rocks and in the present. Investigations in modern settings document sediment-stabilizing microbial mats that form typical sedimentary structures such as MISS (microbially induced sedimentary structures) or stromatolites. In the fossil record such structures are found in banded iron formations, cherts, sandstones, and carbonate rocks. Isotope geochemistry reveals early metabolic pathways and allows conclusions on the evolution of main prokaryotic groups. The evolution of Earth's earliest crust and atmosphere set the stage for life's actors. The understanding of modern analogue environments allows insights into conditions on Earth during its rash and violent youth.



Preliminary Topics, Discussion Leaders and Speakers

Early Earth's Physical Evolution

Mark Barley, Yildirim Dilek, Lee Kump

Very Early Life

Chris Fedo, Harold Furnes, Nicola McLoughlin, Steve Mojzsis

Early Sulphur Metabolizing Microbes

Pascal Philipot, Shuhai Xiao, Mark van Zuilen

Early Microbial Mats in Chert and Modern Analogues

Sherry Cady, Jack Farmer, Maud Walsh, Dave Ward

Early Microbial Mats in Sandy Deposits and Modern Analogues

Christoph Heubeck, Nora Noffke, Tony Prave

Banded Iron Formation Biofilms

Andreas Kappler, Kurt Konhauser, Diane Newman

Stromatolites

Kath Grey, David Paterson, Brian Pratt, Pam Reid, Robert Riding

Modern Biofilms

Bill Costerton, Alan Decho, Peter Greenberg, Ron Oremland, Paul Stoodley

Modern Microbial Mats

Jill Banfield, Katrina Edwards, Thomas Neu, Lucas Stal, Pieter Visscher

Archean/Proterozoic Boundary

Alan Jay Kaufman, Martin van Kronendonk

Eukaryotic Life

Stefan Bengtson, Emanuelle Javeaux, Shucheng Xie

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