

IAMG

Newsletter

Official Newsletter of the International Association for Mathematical Geosciences

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25th anniversary meeting in Prague

The front row includes: Dan Merriam, Mike Hohn, Andrea Förster, Frits Agterberg, Peter Dowd, Jan Harff, John Davis, and Vaclav Nemeč.

This year marks the 50th anniversary of the IAMG's tumultuous start at the interrupted 23rd International Geological Congress (IGC) in Prague. As we celebrate this occasion we can also look back on some of the events and milestones in the society's history. We'll celebrate this milestone at this year's IAMG conference in Olomouc, Czech Republic, with a special social day in Prague to visit the places where it all started. Special issues of all three IAMG journals



(Mathematical Geosciences, Computers & Geosciences and Natural Resources Research) are planned. The open access book "Handbook of Mathematical Geosciences: Fifty Years of

IAMG" will be released at the conference.

The IAMG has been organising meetings and conferences right from the start, beginning with the IAMG-ISI London meeting in September 1969. Many successful conferences have been held since, including the 25th anniversary conference Prague. The IAMG newsletter 47 (edited by James R. Carr) reported 150 participants. A group photo taken outside the Hotel Krystal on October 12, 1993 is below left. In newsletter 47 James Carr reported 'Prague, the city of 100 spires and capitol of the newly formed Czech Republic, played host to the International Association for Mathematical Geology's Silver Anniversary Meeting, held October 10 through 15, 1993. IAMG, formed 25 years earlier at the 23rd International Geological Congress in Prague amid the Russian tank invasion, enjoyed a more open, comfortable city in 1993. Gone are the tanks, replaced instead by an American invasion led by K-Mart, McDonalds, and Little Caesars Pizza. About 150 participants attended the meeting from around the globe. Vaclav Nemeč ... compiled an extraordinary itinerary'.

The IAMG's flagship journal was launched in 1969 with Dan Merriam as the editor. Initially titled the 'Journal of the International Association for Mathematical Geology', this was later changed to 'Mathematical Geology, then the current 'Mathematical Geosciences'.

The introduction of 'Computers & Geosciences' in 1975 and 'Natural Resources Research' in 1992 (originally Nonrenewable resources) broadened the coverage of topics in the IAMG's journals.

The newsletter was first published in 1970 with the brief 'to carry news of the IAMG's activities'. It has never taken itself too seriously, with the second newsletter (edited by Graham Lea) containing this call for information:

2.10 News from Members wanted

The Newsletter is an ideal medium for Departments of half-baked ideas and other informal communication between Members.

Please send a few notes about what you are doing so that others can have a chance to steal your ideas. Don't be selfish.

Someone may give something away that's useful to you if they are provoked.

A photo gallery of the IAMG history is included on pages 6-7. I hope to see many of you in Olomouc!

Katie Silversides

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PRESIDENT'S FORUM

This year has special significance for the IAMG as we achieve our fifty-year anniversary. I'm really looking forward to IAMG2018, to be held in Olomouc (Czech Republic), 2-8 September 2018. Plans are well developed and we have a busy and packed schedule of workshops, presentation sessions, early-career events and keynote speakers. Congratulations to all our 2018 award recipients. The eminent line-up of invited speakers comprises 2018 Distinguished Lecturer, Gregoire Mariethoz, IAMG Matheron Lecturer, Christian Lantuéjoul, recipient of the John Cedric Griffiths Teaching Award, Ute Mueller, William Krumbain Medallist, Roussos Dimitrakopoulos and keynote speakers Guillaume Caumon and Mark Engle.

My thanks to Karel Hron, Ondřej Bábek, Eva Fišerová and all of the local organising team who are looking forward to the moment when their hard work over the last two years comes to fruition in September. Also, I would like to acknowledge B.S. Daya Sagar, Qiuming Cheng and Frits Agterberg for their dedication and commitment to the successful completion of the Golden Anniversary book: "Fifty Years of IAMG", published by Springer, which will be launched at IAMG2018.

One of the highlights at IAMG2018 will be the celebration event in Praha (Prague) to commemorate the 50th anniversary of IAMG's founding. I am so pleased that some of our founding members can attend and will be able to share their experiences and memories. I am particularly grateful to Professor Walter Schwarzacher – my friend and mentor – and a pioneer in mathematical geoscience, who sadly passed away on March 7th. I was privileged to attend his funeral in Belfast and pass on our deepest condolences to Walther's wife June, their two sons and families. Walther's son – also Professor Walter Schwarzacher – reflected on his father's enduring curiosity about the ability of geology to tell time. The legacy of Walther's curiosity is his contribution to quantitative stratigraphy and his seminal work on cyclostratigraphy and the Milankovitch theory. I am grateful to Frits Agterberg for writing a tribute to Walther and his contribution to mathematical geoscience in this newsletter. Walter was particularly pleased to have published in the first ever volume of Mathematical Geology (now Mathematical Geosciences). In 2018 the IAMG journals, Mathematical Geosciences (MG), Computer & Geosciences (C&G) and Natural Resources Research (NRR), continue to provide stimulating insights and new perspectives. Upcoming special issues in MG will explore challenges in processing, integration and assimilation of the diversity of types of data and Data Science in Geosciences, and with an emerging emphasis on energy transition, the issue of Geothermal Energy and Utilization is explored. I'm delighted to welcome Dario Grana, who has been appointed as a new co-editor-in-chief of Computers & Geosciences. Dario has a broad range of acknowledged research expertise and has actively supported early career scientists. Dario initiated the very active IAMG student chapter at the University of Wyoming.

We will continue to explore our commitment to gender diversity at IAMG 2018. June Hill has been chairing a commission exploring the role of women in the IAMG, some initial findings of which will be presented at IAMG2018. I take great pride in the courageous decision of our Council to make the Vistelius award available from this year onwards to both a male and female recipient and to set up a Founders Scholarship for early career researchers. Please make sure you take this opportunity to nominate our excellent early career male and

female members for the Vistelius Awards and the Founders Scholarship, both will be awarded at IAMG2019.

This has been a busy and productive year for the IAMG with MOUs currently being finalised with the EAGE and CODA, active student chapters and IAMG members representing the association at several IAMG sponsored international conferences. I am grateful for IAMG members' involvement in RFG2018, 16-21 June 2018, Vancouver, BC, Canada where IAMG members will contribute to a number of sessions and host a workshop on Advanced Concepts in Evaluating and Interpreting Geochemical Data. The IAMG is a key sponsor of geoENV2018 for keynote presentations by Oy Leuangthong and the 2018 Distinguished Lecturer, Gregoire Mariethoz. The IAMG is pleased to support the good connections with the 15th International Symposium on Mineral Exploration (ISME-XV) November 26-28, 2018 in Kyoto, Japan, where one of main topics is the application of mathematical geology to resource exploration and assessment.



I was personally delighted to be able to host an early career workshop in Belfast 19-23 March which involved 16 PhD students and early career researchers from five universities in China: University of Geosciences Beijing,

University of Geosciences Wuhan, Chengdu University of Technology, Jilin University and Sun Yat-Sen University. The theme of the workshop was the use of GIS and geo-mathematics in Geo-Energy. PhD students who attended from China University of Geosciences Wuhan and Sun Yat-Sen University also represented IAMG Student Chapters. The research topics presented included multifractal analysis, multipoint geostatistics, compositional data, geostatistics, neural networks and 3D modelling. Dr Wenlei Wang, the Vice Chair for the IUGS Young Earth Scientists (YES) Network gave an overview of current activities and collaboration with the YES network. The Chinese workshop participants were also able to enjoy a visit to the Giant's Causeway, UNESCO World Heritage Site.

Looking ahead there is more for us to do. There is enthusiasm and need to develop and extend our IAMG student chapters globally and to provide more opportunity to enable networking between student chapters. Plans are well underway with session themes selected for IAMG2019 which will take place in Pennsylvania State University, Aug 10-16, 2019. Sanjay Srinivasan, Professor of petroleum and natural gas engineering is chair of the local organising committee and has an excellent organizing and scientific committee to assist in the preparations. Congratulations to Philippe Renard, who will present a keynote address as the IAMG2019 Distinguished lecturer.

My continued thanks to all my IAMG colleagues in the Executive Committee, the Council and the broader IAMG community for their tireless support and collaborative efforts to progress the work of IAMG on so many important fronts. I want to acknowledge the immense and important contribution that Regina van den Boogaart contributes in the IAMG office and thank you Katie Silversides for ensuring the timely production of the IAMG newsletter and as Website Editor.

Thank you for all of your support and continued contributions to the IAMG.

Hope to see you at IAMG2018 in September,

Jenny McKinley

Member News

Walther Schwarzacher 1925 - 2018

Walther Schwarzacher, the second IAMG Krumbein Medallist in 1977 and Honorary IAMG Member passed away peacefully on March 7th in Belfast surrounded by his wife June and their two sons with families. In this city he had taught at the Queen's University from 1949 until his retirement in 1990. Eventually, Queen's had appointed him to the personal chair of "mathematical geology".



Walther was born in Graz, Austria on March 2nd, 1925, as the second son of Prof. Schwarzacher who was teaching forensic medicine at the local university. In 1938, when Hitler invaded Austria, the father was thrown out of his position and the family had to spend the war years in exile near the Wailer See, a lake close to Salzburg. After the war Walther went to the University of Innsbruck where he completed both his undergraduate studies and doctoral dissertation within the short period of four years. His PhD supervisor was the distinguished geologist Bruno Sander. Later, during a scientific research expedition to Spitzbergen, Walther named a glacier after Sander. Before moving to Belfast, he had been a British Council Scholar at Cambridge University. In August of 1963 June Whish and Walther got married. She was a young assistant lecturer in botany who obtained her PhD after they were married.

Walther was a pioneer in mathematical geoscience. He wrote two influential books in the field of sedimentology. The first book "Sedimentation models and quantitative stratigraphy" (dedicated to A.B. Vistelius and W.C. Krumbein) was published by Elsevier in 1975. In it he proposed stochastic models for sedimentary processes introducing applications of Markov chains and use of semi-Markov processes. The second book "Cyclostratigraphy and the Milankovitch theory" that appeared in 1993 contains his original evidence for Milankovitch cycles in the thicknesses of coupled limestone and marl beds. He kept up a lifelong interest in these successions first observed in the Dachstein limestones near Lofer in the Austrian Alps, to the extent that after his retirement he rented a plane to view them from above.

In 1967/68 Walther was Distinguished Visiting Lecturer in Dan Merriam's newly formed mathematical geology section at the Geological Survey of Kansas. With June and their two very young sons he lived in the Sunflower Apartments on the campus of Kansas University. During this year he applied statistical time series analysis to local Pennsylvanian limestone-shale sequences and performed experiments simulating the Kansas cyclothem. Walther was one of the founders of the discipline of mathematical geoscience.

From 1980 to 1986, Prof. Schwarzacher was a lecturer in the "Flying Circus" offering short courses in 9 countries on 4 continents under the auspices of the Quantitative Stratigraphy Project of the UNESCO-sponsored International Geological Correlation Program. This included field trips in Brazil, India and China on which he was always accompanied by June who also sat in at numerous scientific sessions and workshops during IAMG and other conferences. Walther was always an interesting person to talk with about subjects including politics and philosophy. His sense of humor was great. On a car ride from Wuhan to Guilin he and I competed in who could count most dogs in the Chinese countryside. Upon arrival from this trip Walther made sketches of the karst landscape along the Li River. He was my friend for 50 years. I had first met him in Kansas in 1968. The last time we met was in Belfast during May 2016. My wife Codien and I visited with Walther and June on many occasions. We were always welcome at their summer home in Kling along the fast-flowing Danube in which Walther had been swimming since he was a little boy. Walther was a good and kind man and a trusted colleague for many of us. He will be greatly missed.

Frits Agterberg

Sharing Preprint and Postprint of Your Publication

A few months ago there was a short discussion about EarthArXiv[1] within the IAMG council. Prof. K. Gerald van den Boogaart, our Publication Committee Chair, asked me to write a short report about it. The EarthArXiv portal is relevant to the sharing of preprints and postprints, and there are many other similar portals such as arXiv, ResearchGate and ESSOAr. Instead of focusing only on EarthArXiv, I thought it might be better take a look at the general guidelines for authors.

A preprint is the author's version of an article without peer review or publisher's edits [2,3]. The public sharing of preprints has many advantages in academic communication. The work can be seen by others much earlier than the final published version on a journal or book. Young researchers can quickly build a academic track record. Other people can see your work without subscription charges [4]. Most publishers allow the open sharing of preprints [5]. For postprints, however, the situation is slightly different. A postprint is the author's accepted manuscript after peer review but not copy-edited by the publisher yet. For the technically enhanced, formatted, and typeset final version of an article, there is a different system about the copyright, and is not the topic here. Different publishers have different policies about postprints. An author may need to check the detailed policy of each publisher. I took a look at the two publishers of the IAMG journals. For instance, Elsevier allows authors to update their released preprints on a portal with the accepted manuscript, and encourages authors to add a link from the preprint to the formal publication via its Digital Object Identifier (DOI) [6]. Springer, in comparison, set an "embargo period": authors can publicly release a postprint only after the first publication from the publisher [3]. Also, an acknowledgement and a link (i.e. DOI) to the formal publication should be made in the postprint. Many portals such as EarthArXiv can also create a DOI for a preprint or postprint.

This will make it citable. However, if there is a formal peer-reviewed publication of the manuscript, citation is recommended to be made to that formal publication [4]. Both the preprint/postprint and the formal publication can be indexed by Google Scholar.

I would recommend the IAMG community, especially young researchers, to take a look at the policy of their articles' publishers and try the services enabled by those preprint and postprint portals.

Xiaogang (Marshall) Ma

[1] <https://eartharxiv.org>

[2] <https://www.elsevier.com/about/our-business/policies/sharing/preprint>

[3] <https://www.springer.com/gp/open-access/authors-rights/self-archiving-policy/2124>

[4] <https://eartharxiv.github.io/faq.html>

[5] https://en.wikipedia.org/wiki/List_of_academic_journals_by_preprint_policy

[6] <https://www.elsevier.com/about/our-business/policies/sharing>

IAMG is on LinkedIn, Twitter and Facebook!

Join the conversation using @IAMG_Math_Geo for news, journal and conference updates.



IAMG at AGU 2017

The International Association for Mathematical Geosciences has a tradition of running an exhibition booth at the American Geophysical Union

(AGU) Fall Meeting, December 2017 saw its first AGU meeting at the Ernest N. Morial Convention Center in New Orleans, Louisiana, and visitor numbers this year exceeded 22,000. The meeting is very international - despite its name - and draws Earth Science attendees from all over the world. The meeting is not only huge in absolute numbers of attendees, but even more so keeps adding increasingly many different sections and focus groups in literally any part of geophysics.



Fig. 1: Statue of Andrew Jackson at Jackson Square, a historic park in the French Quarter of New Orleans, Louisiana.

Visibility of our association to such a large and diverse group of geoscientists is the largest asset for the IAMG. Organizing the booth, as per custom, was Dr. Ute C. Herzfeld helped by her graduate student, Thomas Trantow, who transported gear and primarily ran the exhibit booth.

An icebreaker reception in the exhibit hall was held for all meeting attendees on Monday evening (the first official day of the meeting). For the exhibitors, Monday is a busy day, since the booth needs to be set up, books, journals, a skirted table and chair brought in plus the mandatory carpeting bought. Now, imagine this: There are thousands and thousands of geophysicists waiting behind the doors to be let into the exhibit hall for the icebreaker - and all those people have to make a gap for the exhibitors to pass through. And then AGU opens the flood gate and the masses stream into the exhibit hall looking for beer and booth swag. This year, we strategically selected a booth spot on the way to the central booths (AGU, National Science Foundation, NASA) and refreshments/ food. This brought lots of people to our booth right away and continued to yield excellent traffic throughout the week.

At the booth, IAMG displays our three journals, Mathematical Geosciences, Computers & Geosciences and Natural Resources Research, the newsletter, information on IAMG and any new books or materials members wish to have presented (see Figure 1). One of the objectives of the IAMG exhibit is to attract new members. Interactions and discussion at the booth throughout the meeting garnered widespread interest in our association. Many new members were motivated to join the IAMG at the AGU meeting. An exact count is unknown as most potential members preferred to join online following the instruction sheet headed out at the booth. Many discussions were had with students who seemed particularly interested in the student grants provided by the IAMG. Interest in publishing in one of our three journals is large and a topic of many conversations at the booth. Publication is naturally a significant part of any scientist's existence, and the exhibit ascertains that AGU scientists learn about the great publishing possibilities with the IAMG journals and often subsequently submit papers. It is vital for IAMG that the Earth Science community notices what IAMG does and has to offer to geophysicists. The AGU meeting is also an opportunity to renew our face-to-face relationships to the journal publishers. Much of the publication process is now online, so it is always good to see the people

who are behind the scenes.

To maximize the return of IAMG funds while minimizing cost, each year we drive across the country with all the exhibit materials and furniture. This can be fun, or plainly an endurance quest, or quite a challenge. This was the first time some of our group had ever been down south where the mild, if not pleasant (see Figure 2), winter conditions provided a welcomed change to a chilly and snowy Colorado climate. This year's AGU meeting was a great success and we hope to see you there next year in Washington D.C.!

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Fig. 2: IAMG booth at the 2017 AGU Fall Meeting in New Orleans, LA.

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Commission on Women in IAMG

The IAMG Council has decided to establish a Commission on Women in IAMG to look into opportunities for future development of women's careers in mathematical geosciences and selection of women as IAMG award recipients and IAMG conference keynote speakers.

The commission is composed of 7 members:

- June Hill, CSIRO, Australia (Chairing the commission)
- Vera Pawlowsky, University of Girona, Spain
- Natalie Caciagli, Barrick Gold Corporation, Canada
- Michael Pycrz, University of Texas at Austin, USA
- Pauline Collon, University of Lorraine, France
- Jie Zhao, China University of Geosciences (Beijing), China
- Katie Silversides, University of Sydney, Australia

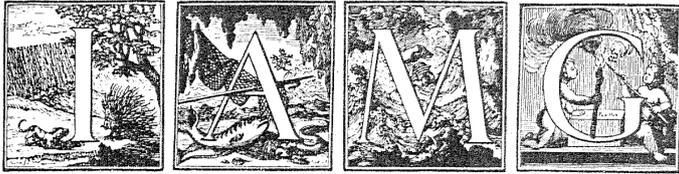
Gender diversity is good for everyone and if we are to attract more women into mathematics and geosciences then we must ensure that women are highly visible and that they are seen to be fairly rewarded for their contributions.

We are asking all IAMG members for input. Specifically, can you provide us with information where you have been involved in improving female representation in the selection of award recipients or keynote speakers for conferences? We would like to know what actions were taken and what was successful and (just as importantly) what was not successful.

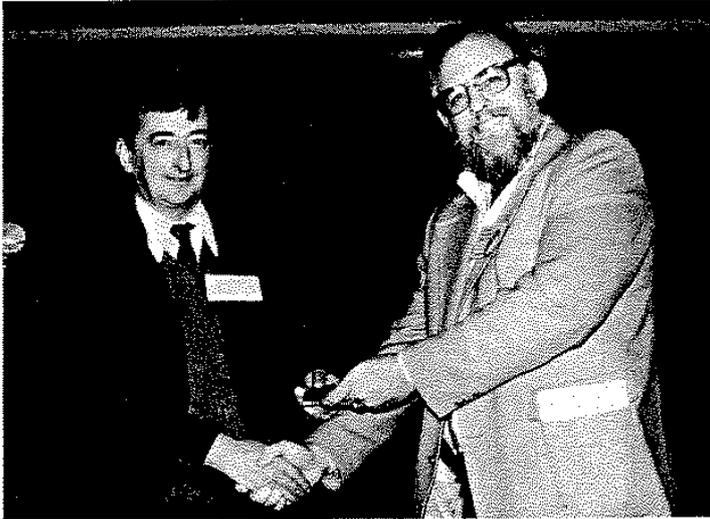
Thank you for your thoughtful contributions.

June Hill <June.Hill@csiro.au>

Images from IAMG's history



Old IAMG newsletter heading, John C. Davis (NL10, 1976)

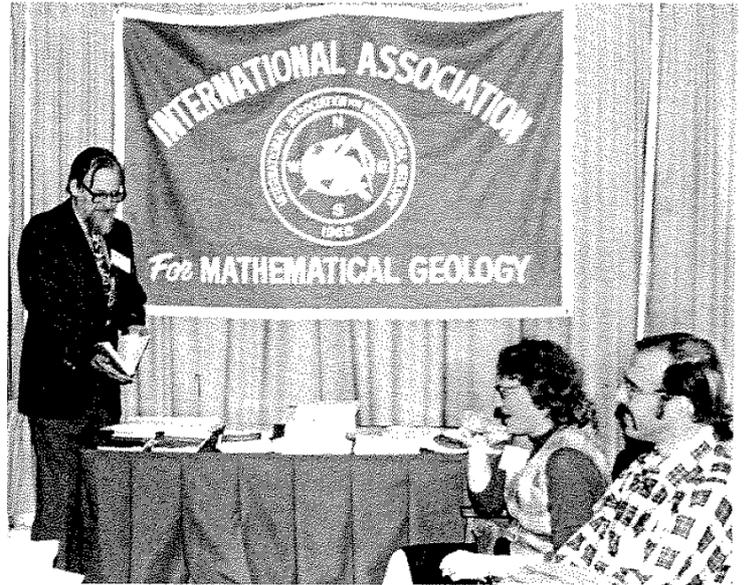


Walther Schwarzacher (l.) accepts the 2nd William Christian Krumbein Medal from D. F. Merriam (r.), President of the IAMG. (NL15, 1978)

... (IAMG) celebrates its tenth anniversary this year. Founded in Prague at the International Geological Congress of 1968, the Association can look back with pride on a decade of progress. During this time, the Association founded two international journals and a newsletter, sponsored numerous meetings, and fostered and facilitated an exchange of ideas on a worldwide basis; in short, it has well fulfilled its aim of promoting international co-operation in the application and use of mathematics in geological research and technology. The more than 400 members are from 46 countries.

... IAMG is affiliated with both the International Union of Geological Sciences (IUGS) and the International Statistical Institute (ISI).... Six national groups have been created and are active in the United States, Canada, Brazil, Great Britain, Czechoslovakia, and Hungary.... Distribution of information is handled mainly through our two international journals: Journal of Mathematical Geology and Computers & Geosciences.... The William Christian Krumbein Medal is presented each year by the Association to an outstanding mathematical geologist.... For those who share these interests and would like to participate in the second decade of an active and viable Association... welcome.... D.F. Merriam
 - from EPISODES, v. 1978, no. 1 (1978)

IAMG after 10 years (NL16-17, 1978)



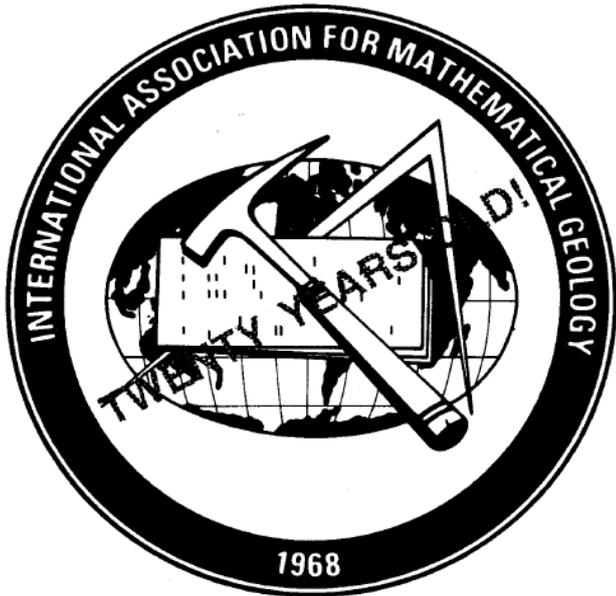
I.A.M.G. Booth at the GSA meeting in Toronto. President Dan Merriam, left, discusses the display of Association publications with Diane Mann and Alan Linberg. Our new Association banner, in bright orange and white, formed a colorful for the booth. (NL19-20, 1979)



The IAMG Council, old and new, photographed on the balcony of the Palais des Congres, Paris. (l. to r.) V. Nemeč, retiring Eastern Treasurer; F. Agterberg, retiring Council member; J. C. Davis, retiring Western Treasurer, new Secretary-General; E.H.T. Whitten, retiring Secretary General, new President; D. F. Merriam, retiring President; V. Vuchev, new Eastern Treasurer; G.Hill, retiring Vice President. (NL24-25 1980)



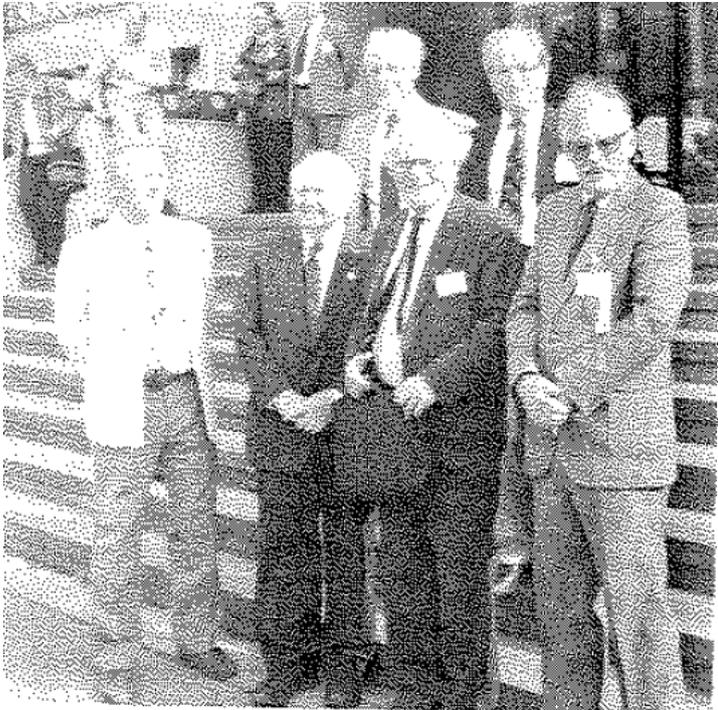
John W. Harbaugh accepts the 10th William Christian Krumbein Medal from Dan Merriam (NL36 1986)



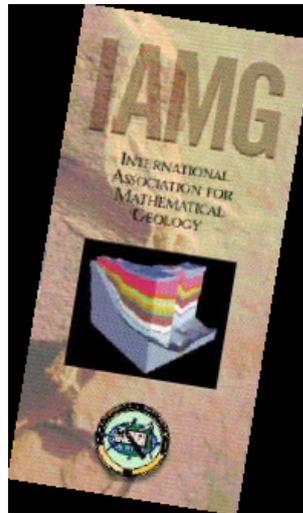
(NL39, 1989)



Cake cutting (Mrs. Harff) for the 30th Anniversary of the founding of IAMG. L to R: A. Buccianti, R. Olea, J. Harff. (NL 57, 1998).



Members of original organizing meeting (August, 1968) of the IAMG: from left, foreground: H. Tiergartner, Dick McCammon, Vaclav Nemecek, and Dan Merriam; from left, background: Fritz Agterberg and E.H. Whitten. (Silver anniversary meeting, NL47, 1993)



New IAMG brochure (NL58, 1999)



(NL61, 2000)

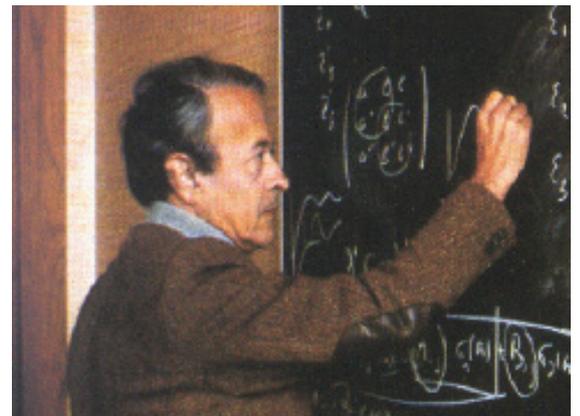


Members of the old and new Executive and Council: left to right - Margaret Armstrong, Frits Agterberg, Maria-Theresia Schafmeister, Dan Tetzlaff, Mike Hohn, Ricardo Olea, Hernani Chaves, Cedric Griffiths. (the International Geological Congress in Rio de Janeiro, NL61, 2000)



Council Meeting: Frits Agterberg, Tom Jones, Tetsuya Shoji, Cedric Griffiths, Dan Tetzlaff, Ricardo Olea, John Tipper, Graeme Bonham-Carter, John Davis, Micheal Hohn, Ute Hertzfeld (l. to r.). (NL55, 1997)

Georges Matheron
†2000
(NL61, 2000)



Multifractals and singularity analysis in mineral exploration and environmental assessments



On April 18th 2016, during the annual meeting of the European Geosciences Union (EGU2016) in Vienna, the IAMG co-sponsored oral and poster sessions (NP3.4) on multifractals and singularity analysis in mineral exploration and environmental assessments. A report by Ed de Mulder on this successful conference was previously published in IAMG Newsletter No. 92. The Proceedings of NP3.4 are now provided in the Journal of Geochemical Exploration (vol. 189, June 2018). Titles of the papers contained in this Special

Issue are:

Preface: Multifractals and singularity analysis in mineral exploration and environmental assessment — Qiuming Cheng, Frits Agterberg

Determination of lithium prospects using fractal modeling and staged factor analysis in Torud region, NE Iran — Nahid Fyzollahi, Habibollah Torshizian, Peyman Afzal, Mohammad Reza Jafari

Evaluation of elemental mineralization rank using fractal and multivariate techniques and improving the performance by log-ratio transformation — F. Darabi-Golestan, A. Hezarkhani

Singularity analysis of magmatic flare-ups caused by India – Asia collisions — Qiuming Cheng

Anisotropic singularity: A novel way to characterize controlling effects of geological processes on mineralization — Wenlei Wang, Qiuming Cheng, Shengyuan Zhang, Jie Zhao

Using multifractal modelling, singularity mapping, and geochemical indexes for targeting buried mineralization: Application to the W-Sn Panasqueira ore-system, Portugal — Mário A. Gonçalves, António Mateus, Filipe Pinto, Romeu Vieira

Can multifractals be used for mineral resource appraisal? — Frits Agterberg

Identification of geochemical anomalies via local RX anomaly detector — Yihui Xiong, Renguang Zuo, Kexin Wang, Jian Wang

Combining global and local scaling methods to detect soil pore space — J.J. Martín-Sotoca, A. Saa-Requejo, J.B. Grau, A. Paz-González, A.M. Tarquis

Soil geochemical follow-up in the Cilento World Heritage Park (Campania, Italy) through exploratory compositional data analysis and C-A fractal model — Matar Thiombane, Daniela Zuzolo, Domenico Cicchella, Stefano Albanese, Annamaria Lima, Marco Cavaliere, Benedetto De Vivo

Measuring the change under compositional data analysis (CoDA): Insight on the dynamics of geochemical — A. Buccianti, A. Lima, S. Albanese, B. De Vivo

Identifying potential Au-Pb-Ag mineralization in SE Shuangkoushan, North Qaidam, Western China: Combined log-ratio approach and singularity mapping — Xin Chen, Rongke Xu, Youye Zheng, Xiaojia Jiang, Wenyang Du

A spatially weighted singularity mapping method applied to identify epithermal Ag and Pb-Zn polymetallic mineralization associated geochemical anomaly in Northwest Zhejiang, China — Fan Xiao, Jianguo Chen, Weisheng Hou, Zhenghai Wang, Yongzhang Zhou, Oktay Erten

Frits Agterberg

Distinguished Lecturer Reports

Gregoire Mariethoz

2018 Distinguished Lecturer

Gregoire Mariethoz's interests reside in ways of characterizing the spatial and temporal variability inherent to most hydrological systems. This involves developing and using a variety of methods including geostatistics (in particular approaches based on training images), image analysis and inverse problems. Such methods are then applied to complex datasets like remote sensing images, hydrological time series or complex aquifers.

He obtained his PhD in 2009 at the University of Neuchâtel, Switzerland. After that, he worked as a researcher at Stanford University, USA. He then moved to the University of New South Wales, Australia, where he was for four years senior lecturer in hydrogeology and chief investigator in the National Center for Groundwater Research and Training. Since 2014, he is professor assistant at the University of Lausanne in Switzerland.

His record includes 80 peer-reviewed journal papers and over 10 major research grants. He developed the Direct Sampling multiple-point simulation method and co-authored the first reference textbook on the topic of multiple-point geostatistics. Since 2016 he is co-editor-in-chief of the journal Computers & Geosciences. Contact by email at gregoire.mariethoz@unil.ch

Organised Lectures

- University Pierre et Marie Curie, Paris, France, 23 February 2018. Title: Data expansion: using analogues to improve remote sensing and climate datasets
- Shanxi University, School of Computer and Information Technology, China, 2-5 February 2018. Title: New statistical models for representing spatial and temporal variability
- Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China, 6 February 2018. Title: Multiple-point statistics: how they work, when to use them, or not to use them
- Indian Statistical Institute, Bangalore, India, 1 June 2018. Title: Data expansion: using analogues to improve remote sensing and climate datasets
- geoENV 2018 conference in Belfast, UK, keynote speech, 4-5 July 2018. Title: Multiple-point geostatistics applications for Earth Observation
- Kyoto University, Japan, 7 June 2018. Title: Enhancing Earth observation datasets using multiple-point geostatistics
- IAMG 2018 conference in Olomouc, Czech Republic, keynote speech, 2-8 September 2018. Title: TBA

For more information on the DL program see iamg.org/special-lectures/current-distinguished-lecturer.html

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IAMG Journal Report

Computers & Geosciences

Dario Grana has been appointed as a new co-editor-in-chief of Computers and Geosciences (from March 1, 2018).



Dario Grana is an assistant professor in the Department of Geology and Geophysics at the University of Wyoming. He received a MS in Mathematics at University of Pavia (Italy) in 2005, a MS in Applied Mathematics at University of Milano Bicocca (Italy) in 2006, and a Ph.D. in Geophysics at Stanford University in 2013. He worked four years at Eni Exploration and Production in Milan. He joined the University of Wyoming in 2013. He is coauthor of the book 'Seismic Reflections of Rock Properties', published by Cambridge University Press in 2014. He is the recipient of the 2017 EAGE Van Weelden Award, the 2016 SEG Karcher Award, and the 2015 Best Paper Award in Mathematical Geosciences. His main research interests are rock physics, seismic reservoir characterization, geostatistics, data-assimilation and inverse problems for subsurface modeling.

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Mathematical Geosciences

Mathematical Geosciences has welcomed:

- a) New Associate Editor: Jo Eidsvik, NTNU, Norway
- b) New Editorial Board member: Denis Allard, INRA, France

Upcoming special issues are:

1. Data Science in Geosciences, Guest Editors: Vasily Demianov, Erwan Gloaguen, Mikhail Kanevski
2. Geothermal Energy and Utilization, Guest Editor: Kewen Li

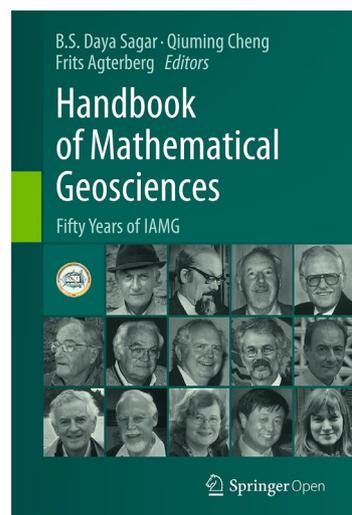
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Natural Resources Research

Natural Resources Research has released a special issue 'Mineral Resources of the Future'. For details see <https://link.springer.com/journal/11053/27/2/page/1>

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Springer Handbook of Mathematical Geosciences: Fifty Years of IAMG



"The Handbook of Mathematical Geosciences: Fifty Years of IAMG"—an Open Access book so that IAMG members as well as all other scientists will be able to freely read its electronic version—is scheduled for release during the 2018 IAMG Conference to be held 2-8 September 2018 in Olomouc and Prague (Czech Republic). The Foreword for the book is written by Professor Zhao Pengda and Professor Frits Agterberg. Corrected proofs of the 45 chapters were received by the publisher, and front and back matter of the book is being finalized. Cover page of this book features Presidents (from past to present) of the IAMG. More details about this book can be seen at Springer's Book webpage available at <https://www.springer.com/us/book/9783319789989>.

B. S. Daya Sagar, Qiuming Cheng and Frits Agterberg

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Natural Resources Research

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Exciting Years Ahead for NRR — Emmanuel John M. Carranza

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A Receiver Operating Characteristics-Based Geochemical Data Fusion Technique for Targeting Undiscovered Mineral Deposits — Mohammad Parsa, Abbas Maghsoudi, Mahyar Yousefi

Investigation of Grade Bias Due to Core Loss Using Bivariate Conditional Distribution — Babak Rajabinasab, Omid Asghari

Geophysical Contributions to Hydrogeological Study in the Chemtou-Sidi Miskine Agricultural Sector (Northwestern Tunisia) - R. Guellala, A. Amiri, R. Ben Lasmar, A. Hamed Ferjeni, I. Jaouadi, M. H. Inoubli, M. Ben Youssef

Groundwater Sampling: Flow-Through Bailer Passive Method Versus Conventional Purge Method — M. Gomo, D. Vermeulen, P. Lourens

Morphometric Parameters-Based Prioritization of Sub-watersheds Using Fuzzy Analytical Hierarchy Process: A Case Study of Lower Barpani Watershed, India — Raihan Ahmed, Haroon Sajjad, Iftikhar Husain

Inversion of Source Parameters from Magnetic Anomalies for Mineral/Ore Deposits Exploration Using Global Optimization Technique and Analysis of Uncertainty — Arkoprovo Biswas

Detection of Gossan Zones in Arid Regions Using Landsat 8 OLI Data: Implication for Mineral Exploration in the Eastern Arabian Shield, Saudi Arabia — Hisham Gahlan, Habes Ghrefat

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Natural Resources Research Publications on Resourcing Future Generations, and Introduction of Papers in this Special Issue — Emmanuel John M. Carranza

Resourcing Future Generations: A Contribution by the Earth Science Community — Edmund Nickless

Towards a More Equitable Use of Mineral Resources — Patrice Christmann

Erratum to: Towards a More Equitable Use of Mineral Resources — Patrice Christmann

Grand Challenges in Metal Life Cycles — T. E. Graedel

Global Trends in Mineral Commodities for Advanced Technologies — Steven M. Fortier, Christine L. Thomas, Erin A. McCullough, Amy C. Tolcin

The Rare Earth Elements: Demand, Global Resources, and Challenges for Resourcing Future Generations — Kathryn M. Goodenough, Frances Wall, David Merriman

Innovation in Resourcing Geological Materials as Crop Nutrients — David A. C. Manning

Global Resource Assessments of Primary Metals: An Optimistic Reality Check — Gavin M. Mudd, Simon M. Jowitt

Unresolved Complexity in Assessments of Mineral Resource Depletion and Availability — Stephen A. Northey, Gavin M. Mudd, T. T. Werner

Journal Statistics

Mathematical Geosciences:

2016 ISI Impact factor: 2.022 (SJR = 1.083)

5-Year Impact Factor: 2.067 (SNIP = 1.566)

Ave. review time: 61 days (submission to first decision)

Computers & Geosciences:

2016 ISI Impact Factor: 2.533 (SJR=1.083)

5-Year Impact Factor: 2.818 (SNIP=1.736)

Ave. review time: 12.1 weeks (submission to final decision 2017)

Natural Resources Research:

2016 SJR = 0.567

2016 SNIP: 0.830

Ave. review time: 21 days (submission to first decision 2016)

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Mathematical Geosciences

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Pseudo-outcrop Visualization of Borehole Images and Core Scans — Evgeny M. Mirkes, Alexander N. Gorban, Jeremy Leskeyev, Peter A. S. Elkington, James A. Whetton

Reconstruction of Channelized Systems Through a Conditioned Reverse Migration Method — Marion N. Parquer, Pauline Collon, Guillaume Caumon

A Workflow for Static Reservoir Modeling Guided by Seismic Data in a Fluvial System — Mohammad Koneshloo, Saman A. Aryana, Dario Grana, John W. Pierre

Automatic Identification of Rock Fracture Sets Using Finite Mixture Models — Jiewei Zhan, Jianping Chen, Peihua Xu, Wen Zhang, Xudong Han, Xin Zhou

Solving the Vialov Equation of Glaciology in Terms of Elementary Functions — Valerio Faraoni

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Mathematical Geosciences Best Paper Award 2016

Farewell to Daniel F. Merriam (1927–2017) — Michael E. Hohn

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High-Dimensional Intrinsic Interpolation Using Gaussian Process Regression and Diffusion Maps — Charanraj A. Thimmisetty, Roger G. Ghanem, Joshua A. White, Xiao Chen

Which Path to Choose in Sequential Gaussian Simulation — Raphaël Nussbaumer, Grégoire Mariethoz, Erwan Gloaguen, Klaus Holliger

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Geostatistics for Environmental Applications — Maria João Pereira, Amílcar Soares

Conditional Latin Hypercube Simulation of (Log)Gaussian Random Fields — Stelios Liodakis, Phaedon Kyriakidis, Petros Gaganis

Hybrid Inversion Method to Estimate Hydraulic Transmissivity by Combining Multiple-Point Statistics and a Direct Inversion Method — Alessandro Comunian, Mauro Giudici

Oscillatory Pumping Test to Estimate Aquifer Hydraulic Parameters in a Bayesian Geostatistical Framework — D'Oría Marco, Zanini Andrea, Cupola Fausto

Indicator-Based Geostatistical Models For Mapping Fish Survey Data — Pierre Petitgas, Mathieu Woillez, Mathieu Doray, Jacques Rivoirard

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The Evolution of Geological Shape Descriptors Under Distance-Driven Flows — Gábor Domokos, Zsolt Lángi

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Computers & Geosciences

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A path-level exact parallelization strategy for sequential simulation — Oscar F. Peredo, Daniel Baeza, Julián M. Ortiz, José R. Herrero

In situ visualization and data analysis for turbidity currents simulation — Jose J. Camata, Vitor Silva, Patrick Valdúriez, Marta Mattoso, Alvaro L.G.A. Coutinho

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Displacement prediction of Baijiabao landslide based on empirical mode decomposition and long short-term memory neural network in Three Gorges area, China — Shiluo Xu, Ruiqing Niu

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A computational geometry approach to pore network construction for granular packings — Joost H. van der Linden, Adnan Sufian, Guillermo A. Narsilio, Adrian R. Russell, Antoinette Tordesillas

The art and science of data curation: Lessons learned from constructing a virtual collection — Kaylin Bugbee, Rahul Ramachandran, Manil Maskey, Patrick Gatlin

Landslide susceptibility modeling applying machine learning methods: A case study from Longju in the Three Gorges Reservoir area, China — Chao Zhou, Kunlong Yin, Ying Cao, Bayes Ahmed, Yuanyao Li, Filippo Catani, Hamid Reza Pourghasemi

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Maxwell: A semi-analytic 4D code for earthquake cycle modeling of transform fault systems — David Sandwell, Bridget Smith-Konter

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Parallel optimization of signal detection in active magnetospheric signal injection experiments — Michael Gowanlock, Justin D. Li, Cody M. Rude, Victor Pankratius

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FabricS: A user-friendly, complete and robust software for particle shape-fabric analysis — G. Moreno Chávez, F. Castillo Rivera, D. Sarocchi, L. Borselli, L.A. Rodríguez-Sedano

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Ambient occlusion – A powerful algorithm to segment shell and skeletal intrapores in computed tomography data — J. Titschack, D. Baum, K. Matsuyama, K. Boos, C. Färber, W.-A. Kahl, K. Ehrig, D. Meinel, C. Soriano, S.R. Stock

SeisFlows—Flexible waveform inversion software — Ryan T. Modrak, Dmitry Borisov, Matthieu Lefebvre, Jeroen Tromp

Water Residence Time estimation by 1D deconvolution in the form of a -regularized inverse problem with smoothness, positivity and causality constraints — Alina G. Meresescu, Matthieu Kowalski, Frédéric Schmidt, François Landais

AqSo NaCl: Computer program to calculate p-T-V-X properties in the H₂O-NaCl fluid system applied to fluid inclusion research and pore fluid calculation — Ronald J. Bakker

Automatic contouring of geologic fabric and finite strain data on the unit hyperboloid — Frederick W. Vollmer

A method for automatic grain segmentation of multi-angle cross-polarized microscopic images of sandstone — Feng Jiang, Qing Gu, Huizhen Hao, Na Li, Bingqian Wang, Xiumian Hu

ClimateSpark: An in-memory distributed computing framework for big climate data analytics — Fei Hu, Chaowei Yang, John L. Schnase, Daniel Q. Duffy, Mengchao Xu, Michael K. Bowen, Tsengdar Lee, Weiwei Song

The Simple Concurrent Online Processing System (SCOPS) – An open-source interface for remotely sensed data processing — M.A. Warren, S. Gault, D. Clewley

A review of numerical techniques approaching microstructures of crystalline rocks — Yahui Zhang, Louis Ngai Yuen Wong

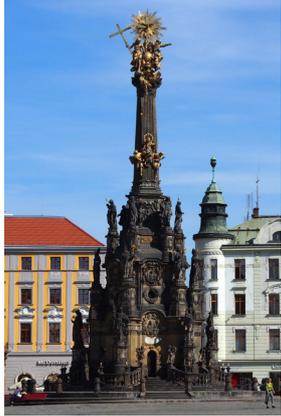
A novel tree-based algorithm to discover seismic patterns in earthquake catalogs — E. Florido, G. Asencio-Cortés, J.L. Aznarte, C. Rubio-Escudero, F. Martínez-Álvarez

Earthquake prediction in California using regression algorithms and cloud-based big data infrastructure — G. Asencio-Cortés, A. Morales-Esteban, X. Shang, F. Martínez-Álvarez

IAMG Conference News

IAMG2018: Join the 50th Anniversary Meeting!

The 19th Annual Conference of the International Association for Mathematical Geosciences (<http://www.iamg2018.org/>) on the occasion of the 50th anniversary of the Association, held on 4-7 September 2018 in Olomouc, Czech Republic, is approaching! Although abstract submission is already closed, it is still not too late to come and join attractive **short courses**, interesting and low cost **field trips** and the **commemorative event in Prague**. Capacity is limited for the **commemorative event in Prague so please book soon!**



Come to Olomouc and make IAMG's annual conference your meeting with colleagues and friends. Come to the Czech Republic to make IAMG2018 a Golden Anniversary to remember!

Register at

<http://www.iamg2018.org/index.php/registration/>

For further information please contact: iamg2018@iamgmembers.org

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IAMG2019

First Announcement for IAMG2019 Annual Meeting in State College, Pennsylvania on the beautiful campus of The Pennsylvania State University. Please mark your calendars for the meeting dates August 10-16, 2019. Topics for short courses and sessions should be sent to Sanjay Srinivasan sanjays@psu.edu or Juliana Leung juliana2@ualberta.ca.

The University Park campus of The Pennsylvania State University (Penn State) is situated in Central Pennsylvania amidst the beautiful Appalachian Mountains. It is conveniently connected to the major airports in New York, Philadelphia, Washington D.C., Pittsburgh and Harrisburg by air (1 hr flight), train (approx. 4 hrs), bus (approx. 4 hrs) and driving (approx. 3.5 hrs). The College of Earth and Mineral Sciences houses world renowned programs in Geological Sciences, Petroleum and Natural Gas Engineering, Mining Engineering, Energy Engineering, Energy and Business Finance, Meteorological Sciences, Geography and Material Sciences. The college, quite literally, encompasses all the major disciplines and topical areas of interest of the proposed conference. The university is located in the midst of a major unconventional shale gas production area, is in close proximity to coal and mineral mining areas, and is home to world-renowned climatologists and meteorologists.



INTERNATIONAL ASSOCIATION FOR MATHEMATICAL GEOSCIENCES



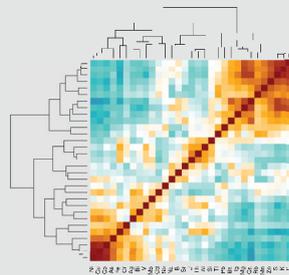
19th Annual Conference

IAMG 2018

2-8 SEPTEMBER | OLOMOUC | CZECH REPUBLIC
50TH ANNIVERSARY OF IAMG



„APPLICATIONS OF MATHEMATICS, STATISTICS, COMPUTER SCIENCE AND INFORMATICS IN SOLVING PROBLEMS OF GEOSCIENCES ARE WELCOME!“



www.iamg2018.org



Faculty
of Science

data-analysis OG

IAMG Annual Conferences

With this note I would like to update on the perspective of our next Annual Conferences.

- IAMG2018 in Olomouc, Czech Republic, Sep 2-8 is just less than 3 months ahead of us. Since it marks IAMG's Golden Anniversary, the scientific sessions in Olomouc will be completed by a celebration of the anniversary in Prague on Sep 8, 2018. For all the details, you are referred to <http://www.iamg2018.org/>
- IAMG2019 will be hosted at State College, Pennsylvania, USA, Aug 10-16, 2019, and chaired by Sanjay Srinivasan.
- IAMG2020 will be part of the International Geological Congress (IGC'2020) to take place in New Delhi, India, March 2-8, 2020, just half a year after our IAMG2019. The date is due to the climate, the quick sequence of conferences may pose a challenge.

Eventually, we should be thinking of IAMG2021. Therefore, we have started the search process for the selection of a site to hold its 21th annual scientific and technical conference sometime in the summer or fall of 2021. Parties interested in hosting and co-organizing the event together with IAMG are welcome to visit the site www.iamg.org/index.php/publisher/articleview/frmArticleID/150 for detailed guidelines. Even though it may appear way ahead of us, I would like to encourage proposals to host IAMG2021 now.

Helmut Schaeben, Meetings Committee (Chair)



Upcoming Meetings

2018

80th EAGE Conference & Exhibition 2018, 11-14 June, Copenhagen, Denmark. <https://events.eage.org/2018>

3rd International Conference on Natural Science and Applied Mathematics, 15-18 June 2018, Prague, Czech Republic. <http://www.icsam.org/>

RFG 2018 Resources for Future Generations by International Union of Geological Sciences (IUGS), Vancouver, Canada, 16-21 June 2018. Info at <http://RFG2018.org>. IAMG is one of a dozen Partners supporting this conference.

CoDaCourse, 2-6 July 2018, Girona. <http://www.compositionaldata.com/codacourses.php>

GeoENV2018, Belfast, U.K., 3-7 July 2018. <http://geoenvia.org/2016/08/geoenv-2018-in-belfast>

5th GeoChina International Conference, 23-25 July 2018, HangZhou, China. <http://geochina2018.geoconf.org/>

2018 Joint Statistical Meetings, 28 July-2 Aug, Vancouver. <http://www2.amstat.org/meetings/jsm/2018/>

IAMG2018 50th Anniversary Meeting, Olomouc and Prague, Czech Republic, 2 - 8 Sept. 2018

16th European Conference on the Mathematics of Oil Recovery, ECMOR XVI, 3 - 6 Sept 2018, Barcelona. <https://events.eage.org/2018/ECMORXVI>

Near Surface Geoscience Conference & Exhibition 2018, 9-13 Sept, Porto, Portugal

SIAM Conference on Mathematics of Planet Earth (MPE18), 13-15 Sept, Philadelphia, USA. <http://www.siam.org/meetings/mpe18/>

Seismic Characterisation of Carbonate Platforms and Reservoirs, The Geological Society 10-11 Oct 2018. <https://www.geolsoc.org.uk/carbonateplatforms18>

Australian Geoscience Council Convention (AGCC 2018), 14-18 Oct, Adelaide, Australia. <https://www.agcc.org.au/>

The AAPG 2018 International Conference & Exhibition, 4-7 Nov, Cape Town, South Africa. <http://capetown2018.iceevent.org/>

2018 GSA Annual Meeting, 4-7 Nov, Indianapolis, Indiana, USA. http://www.geosociety.org/GSA/Events/Annual_Meeting/GSA/Events/gsa2018.aspx

15th International Symposium on Mineral Exploration (ISME-XV), Nov 26-28, Kyoto, Japan. <http://www.isme-detec.org/ISMExv/>

4th EAGE Eastern Africa Petroleum Geoscience Forum, 3-5 Dec, Nairobi, Kenya. <https://events.eage.org/en/2018/fourth-eage-eastern-africa-petroleum-geoscience-forum>

AGU 2018 Fall Meeting, 10-14 Dec 2018, Washington D.C. <https://fallmeeting.agu.org>

2019

AAPG 2019 Annual Convention & Exhibition, 19-22 May, San Antonio, Texas, United States

Application Of Computers And Operations Research In The Mineral Industry (APCOM2019), 4-6 June, Wroclaw, Poland. <https://apcom.info/>

IAMG2019, 10-16 Aug, Pennsylvania, USA

62nd ISI World Statistics Congress, International Statistical Institute, Kuala Lumpur, Malaysia, 18-23 Aug 2019.

AGU 2019 Fall Meeting, 9-13 Dec, San Francisco, California. <https://fallmeeting.agu.org>

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AGCC 2018 Big Issues and Ideas in Geoscience

www.agcc.org.au

We invite you to participate in AGCC 2018 in Australia in October, particularly in the subtheme topic:

4.6. Mathematics, modelling, AI, robotics and machine learning applied to the acquisition and interpretation of large or complex geoscience data sets

Automation in the resources industry is being driven by a need for increased safety, efficiency and productivity, as well as reducing negative environmental impacts. This session will present recent advances in automation for the geosciences as well as overviews of the current state of research and development in this field.

Areas of interest will include:

- Autonomous mining, haulage and drilling
- Managing large and complex geoscientific digital datasets and physical collections
- Interpreting large and complex geoscientific data sets (e.g. using spatial statistics, machine learning, complex systems, fractal methods)
- Improved 3D geology modelling software: more geologically realistic, faster to generate, better integration of data
- Understanding uncertainty in predictive geosciences

For more information contact: June.Hill@csiro.au

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Report on the Ninth International Conference on Advances in Pattern Recognition (ICAPR 2017) December 27-30, 2017

In celebration of the 125th Birth Anniversary of Professor P. C. Mahalanobis, a world-famous mathematical statistician, the Ninth International Conference on Advances in Pattern Recognition (ICAPR-2017) was organized during 27-30 December 2017 at the Indian Statistical Institute-Bangalore Centre. More details about this Conference can be seen at: <http://www.isical.ac.in/~icapr17>

B. S. Daya Sagar

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IAMG2018 Social Event in Prague

Prague is one of Europe's best-preserved cities, with a romantic riverside location enhanced by graceful bridges and a magnificent skyline punctuated with medieval church spires. During this brief excursion we visit the popular touristic sites, like Prague Castle, St. Vitus Cathedral, Charles Bridge, Prague astronomical clock, or Wenceslas Square. But even more importantly, we will visit places that were crucial for establishing of IAMG and witnesses will talk about the tumultuous summer of 1968... Join us for this memorable event!



2016 Student Research Grants

Mathematical Geosciences Student Award

MG-2016-03 - Liu Qiyuan (SYSU)

Title: Long-term Exposure to Inorganic Arsenic Contamination and Cancer Mortality for Residents near Dabaoshan Mine, South China

Abstract: Mining and smelting influence environmental quality and poses high risk to human health as large amounts of heavy metals and metalloids are emitted into the environment from slagheap and wastewater. Inorganic arsenic (iAs) is considered a carcinogenic element. Long-term exposure to iAs can cause both non-cancer health effects and external and internal cancers in human body, which however, has been rarely studied. This work aim to explore the cancer mortality of long-term community and vicinity-level iAs exposure in general population. Cancer mortality (from 2004 to 2005) records were collected from local government agency. Each soil sample was measured by ICP-MS for further division of three iAs exposure categories (high vs. medium vs. low). Internal comparisons were performed, and standard rate ratio was calculated to describe the association between iAs exposure and cancer mortalities by using low-exposure group as the reference group. Arsenic (As) was detected in all 21 soil samples ranging from 2.766 mg/kg to 88.26 mg/kg. A total of 806 cases (533 male and 273 female cases) in the total population of 972,970 aged 1-98 years were collected. The cancer mortality in the high-exposure group was remarkably high. Internal comparisons indicated that high iAs exposure might be positively associated with high cancer mortality in local population. Even the low-exposure group was found to have relative high cancer mortality.

MG-2016-10 - Xintong Li (KSU)

Title: Isotropic Variogram Models on All Spheres

Abstract: Variogram or variogram matrix functions play an important role in modeling dependence structure among multiple processes at different locations in spatial statistics. This paper characterizes the variogram models on spheres of all dimensions for intrinsically stationary, isotropic, univariate, and multivariate processes. Efficient approaches are proposed to construct a variety of isotropic variogram functions including simple polynomial structures. Series representations and spherical behavior of intrinsic stationary random fields are elaborated in both theoretical and simulation study. Applications of the proposed model and related theoretical results are demonstrated using simulation and real data analysis.

MG-2016-14 - Manolis P. Petrakis (TUC - Techn. Univ. Crete)

Title: Non-stationary covariance functions based on local interactions

Abstract: In modeling localized extreme values, e.g., radioactivity emergencies due to an accidental release, the stationarity assumption usually employed in random field theory, no longer holds. Spartan spatial random fields are a class of Gibbs random fields in which the probability of a given field configuration is determined by an effective local energy functional instead of a model covariance. In this work, we propose new, non-stationary Spartan covariance functions for the interpolation of such data sets. We treat the extreme values by means of an effective local energy functional perturbation, and we derive approximate but explicit non-stationary covariance functions using the leading-order perturbation expansion.

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Computers and Geosciences Scholarship

CG-2016-11 - Yu Zhao (Univ. of Tulsa)

Title: 3D Non-Gaussian Facies and Reservoir Properties Estimation Based on Bayesian Geostatistical Framework

CG-2016-16 - Yaqian Long (Univ. Alberta)

Title: The application of machine learning techniques in discriminating similar rock types using hyperspectral remote sensing

Abstract: Discrimination of rock types was commonly implemented by field investigation or lab chemical analysis that are time-consuming and expensive. Hyperspectral remote sensing provides an economic, fast and nondestructive tool for lithological mapping in large-scale. The availability of reliable data and limited samples constrain the spread of hyperspectral data into geologic applications. Furthermore, the cutting-edge technique to process the data lags behind in the geologic community. As Machine Learning (ML) prevails in a variety of applications for big data, it is imperative to explore how this powerful technique can be more readily utilized in hyperspectral analysis. In this paper, hyperspectral data from different platforms (field, lab, airborne) are provided for the geologic mapping in the Ni-Cu-PGE mineral deposit of Cape Smith Belt, Canada. A hyperspectral image scanned from the lab SisuROCK system was collected to classify six similar types of mafic and ultramafic rocks using the traditional mapping method of Spectral Angle Mapper (SAM) and ML technique of Random Forest (RF). Classification results show that RF outperforms SAM in mapping accuracy. This RF model also generates a set of bands as a reference to the band selection in an airborne AISA image. Then the Spectral Mixture Analysis (SMA) was applied on the band-reduced image to map the 18 ground materials in the study area. Meanwhile, RF is again used to map the same mafic and ultramafic rocks based on the previous SMA results. Although the RF does not perform better than SMA, we still can utilize this data-driven method to reduce the effort in gathering geologic expert knowledge for SMA. The ML technique of RF is a robust tool to analyze the spectral data for rock discrimination, even if a small number of samples are provided.

CG-2016-20 - Thomas Trantow (Univ. Colorado)

Title: Constraining ice-dynamic models during acceleration events by spatiotemporal mapping of deformational provinces on a glacier surface

Abstract: Research for this project focuses on derivation of novel data analysis and numerical modeling techniques applied to the study of glacial acceleration mechanisms and the surge phenomenon in particular. Glacial acceleration, of which surging is the least understood type, is a main uncertainty in modeling future sea level rise according to the Intergovernmental Panel on Climate Change (IPCC). There are currently no numerical ice sheet models that account for surging, treating all types of glacial acceleration the same, thus limiting our ability to accurately predict glacier mass balance. Surging is notoriously difficult to study due to the rapid accelerations and large scale deformation at the glacier surface that tend to complicate many of the traditional glaciological techniques. In this work, I develop an approach that utilizes crevasses and general surface deformation to study the surge. The approach includes numerical experiments using a new dedicated surge model (finite element), and spatial statistical tools used in analysis of airborne and satellite data, applied to the 2011-2013 Bering-Bagley Glacier System (BBGS) surge, Alaska. The approach provides insight into the surge mechanisms acting in the BBGS helping us better understand glacial acceleration. In addition, this project helps bridge the gap between numerical modeling and observational analysis in glaciology.

Natural Resources Research Student Award

NRR-2016-03 - Jon Hey (Western Univ., Ontario)

Title: Geology and mineralogy of the Rowley River iron oxide deposit, North Baffin Island, Nunavut

Abstract: Baffinland Iron Mines' Mary River Project is located on the northern end of Baffin Island, Nunavut, Canada. Regional geological mapping has identified banded-iron formation (BIF) direct shipping iron ore (DSO) within high-grade gneisses correlated to the Mary River Group (MRG). The MRG forms the northern extension of the central Rae Committee Bay Belt. On north Baffin the MRG is characterized by lower metagreywacke overlain by a BIF-komatiite-quartzite cover sequence. Regionally, the BIF member hosts high-grade magnetite ores, with grades averaging 65 wt % Fe.

This study has used several techniques to explore the trace and rare earth element geochemistry of iron oxides to help determine the process(es) which have enabled the natural beneficiation of BIF to DSO. Petrography and LA-ICP-MS analysis have revealed several stages of ore paragenesis using trace and rare earth element abundances: (1) leaching of gangue minerals and mineralization of massive magnetite ore; (2) martitisation of magnetite; and (3) formation of granoblastic hematite. Inferences have been made regarding the provenance of the MRG iron formations through the study of geochemical signatures of the magnetite layers in the BIF.

NRR-2016-04 - Caterina Gozzi (Univ. Firenze)

Title: Geochemical modelling of groundwater systems by Compositional Data Analysis (CoDA) approach

Abstract: Compositional data are known in geology as closed data since, frequently, they sum to a known total, typically 100 for percentage data, and it is now well known that the usual Euclidean geometry does not represent a proper tool for their statistical analysis. Results can end up outside the sample space, distances between samples are not correctly managed, and inferential statistics, based on independence, is not correctly applied. For this reason, the concentrations of solutes and contaminants in ground and surficial waters should be considered in a compositional context, and it is necessary to study implications of considering the simplex, with its proper geometry as the natural sample space. A fundamental role, study- ing chemical reactions and geochemical process, is also played by the distributional analysis. In fact, the shape of the frequency distribution of geochemical variables reveals important information about the governing dynamics of the system that gave birth to the distribution. Moreover, the distribution shape can be used to approximate the shape of basins of attraction and this allows us to make helpful observations about the resilience of the system taken into account. Compositional Data Analysis paired with an adequate distributional analysis of geochemical variables appears to be a very important tool for a better understanding of processes governing water chemistry.

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Post-doctoral research fellow positions

available at the COSMO research group at McGill University in

Stochastic Optimization of Mining Complexes/ Mineral Value Chains

and

Geostatistics and Stochastic Simulations

See back page for details

Student Chapter News

A student exchange GeoEnergy workshop was hosted from 19 - 23 March, by the Centre for GIS and Geomatics in the School of Natural and Built Environment, Queen's University Belfast. The theme of the workshop was the use of GIS and geomathematics in Geo-Energy. In total fourteen PhD students and three early career researchers attended the workshop. PhD students who attended from China University of Geosciences Wuhan and Sun Yat-Sen University also represented IAMG Student Chapters. As well as delivering an oral presentation with opportunity for questions and discussion on their research, the students had the opportunity for knowledge transfer through an invited lecture by Dr Martin Smith, Global Director of British Geological Survey (BGS). Dr Wenlei Wang, the Vice Chair for the IUGS Young Earth Scientists (YES) Network gave an overview of the YES network. The Chinese students also had the opportunity to meet final year undergraduate Geography students studying GIS and QUB PhD students. The Chinese workshop participants enjoyed cultural visits to Belfast City and the UNESCO World Heritage Giant's Causeway.



International Association for Mathematical Geosciences
(IAMG)

c/o IAMG Office
Balthasar-Rößler-Str. 58
09599 Freiberg
Germany



POST-DOCTORAL RESEARCH FELLOW POSITIONS IN Geostatistics and Stochastic Simulations Stochastic Optimization of Mining Complexes/Mineral Value Chains

Post-doctoral positions are available at the COSMO Stochastic Mine Planning Lab, McGill University (<http://cosmo.mcgill.ca>). COSMO is a collaborative laboratory dedicated to the development of new orebody modelling and optimization frameworks for production planning creating value across the mining-mineral value chain. The related industrial environment requires particular focus on 'high-order' & 'multi-point' mathematical models of geological uncertainty, which generate inputs for various applications. Research is funded by the National Sciences and Engineering Research Council of Canada and a consortium of major mining companies: AngloGold Ashanti, Barrick Gold, BHP, DeBeers, Kinross Gold, Newmont Mining, Vale.

Job description - Geostatistics and Stochastic Simulations

Successful candidates will work on one (or more) of related research areas:

- * New data-driven, high-order and multi-point simulations
- * High-order data analytics, related deep learning methods
- * High-order simulation of multiple categorical variables
- * Construction of data-based continuous training images
- * Applications in modelling mining deposits
- * Reservoir modelling and multiphase flow forecasting; geological CO₂ sequestration

Job description - Stochastic Optimization of Mining Complexes/Mineral Value Chains

Successful candidates will work on one (or more) of related research areas:

- * Combining new stochastic simulation methods and operations research approaches
- * Simultaneously optimizing production in mining complexes with uncertainty

Candidates will have the opportunity to apply their developments at sites worldwide, test newly developed methods on real-life applications and gain substantial experience with advanced digital technologies in industrial environments. In conjunction with their research, candidates are expected to interact with graduate students and industry professionals, and be involved in diverse projects led by the COSMO Laboratory, including global knowledge mobilization activities.

Building future career opportunities: Post-doctoral fellows from COSMO develop major career opportunities; our last 3 moved on to BHP principal scientist (geostatistics), DeepMind research engineer, faculty at Univ. of Calgary.

Requirements: Candidates are required to have completed (or being close to completion) a PhD in areas including:

- 1 - Applied mathematics, computer science, image processing, mining engineering or a related discipline.
- 2 - mining engineering, mining operations research or industrial engineering

Both require excellent programming skills (C/C++) and a suitable academic and publications record.

Application: The application procedure will remain open until the position is filled. If interested, please contact Roussos Dimitrakopoulos at E-mail: roussos.dimitrakopoulos@mcgill.ca or tel. 514 398-4986, and forward a detailed CV, including a list of publications, research interests, and the names of three referees.