

INTERNATIONAL ASSOCIATION FOR MATHEMATICAL GEOSCIENCES

Annual Report to the International Union of Geological Sciences for 2019

1. Overall objectives

The mission of the International Association for Mathematical Geosciences (IAMG) is to promote, worldwide, the advancement of mathematics, statistics and informatics in the geosciences. The main duty of the IAMG is to further method development and disseminate results of new research in its fields of interest with outreach within the geoscience, mathematics and geoinformatics communities. This includes sponsoring students and young scientists by means of research and travel grants.

2. Relate goals to overall IUGS scientific objectives

By means of its three scientific journals, the annual IAMG meeting and many other projects including travel by its Distinguished Lecturers, the IAMG aims to further the quantification of three-dimensional geoscientific mapping, numerical time scale development and geological process modelling. Its contributions to predictive geology are concerned with natural disasters as well as the delineation of mineral, hydrocarbon and water deposits in the crust of the Earth. The mathematical and geometrical estimates are accompanied by estimates of their uncertainty.

3. Structure and organization

The IAMG is governed by a Council consisting of its Executive Committee (President, Executive Vice President, Secretary General and Treasurer), two Vice Presidents, Past President, four Ordinary Council Members, special IGC Councillor, three Editors-in-Chief, and Newsletter/Website Editor. It has seven standing committees for Awards, Curriculum Quality, Lectures, Meetings, Outreach, Publications and Student Affairs, respectively, and various commissions for shorter term concerns.

4.

5. Interaction with other International organizations and projects

Currently IAMG membership represents 63 countries across the globe. The IAMG is affiliated with IUGS, IUGG and ISI. It is Scientific International Partner of the Earth Science Matters Foundation (ESM). IAMG has eight Student Chapters and co-organizes international meetings for young earth scientists with YES. IAMG maintains a joint booth with ESM and the International Lithosphere Program. Additionally, the IAMG annually has a booth and co-organizes sessions at the AGU Fall Meeting in San Francisco, U.S.A. The IAMG President (Jennifer McKinley) continues to act as Communications Officer for the IUGS Initiative on Forensic Geosciences (IUGS-IFG). Most recently this involved meeting with the 36th IGC organising committee in New Delhi November 2018 in preparation for an IFG session and workshop at IGC2020. Two IAMG members (Ricardo Olea and Nishi Nishiwaki) serve on the IUGS Nominating Committee. Jennifer McKinley has been nominated by the IAMG to sit on the IUGS Council 2020-2024

Through the IAMG Outreach Committee, there is continued collaboration with other international associations including the International Union of Geological Sciences

(IUGS), International Union of Geodesy and Geophysics (IUGG), American Geophysical Union (AGU), European Geoscience Union (EGU), European Association of Geoscientists and Engineers (EAGE), Earth Science Matters (ESM), Southern African Institute of Mining and Metallurgy (SAIMM), International Association for Young Earth Scientists (YES), Joint Statistical Meetings (JSM), Future Earth Coast (former LIOCZ), Geological Society of London (GSL), the Royal Irish Academy (RIA), China Union of State Key Laboratories in Solid Earth Sciences, the UNESCO International Centre on Global-scale Geochemistry (ICGG) and the Chinese Academy of Geosciences. An agreement has been signed for collaboration between the Association for Compositional Data Analysis (CODA) and the IAMG is in the process of developing a collaborative strategy with the Association of Applied Geochemists (AAG).

The IAMG is a founding partner of the Global Deep Time Digital Earth Initiative (DDE) proposed as an IUGS-recognized 'Big Science Program' to be launched at the 36th International Geological Congress in New Delhi. This is another excellent opportunity for the IAMG to strengthen the relationship with IUGS and other associations. IAMG President co-lead a session in the Silk Roads Disaster Risks Reduction and Sustainable Development (SiDRR) conference, May 2019 which presented an important area of applied research in mathematical geoscience.

Members of the IAMG council participated in EAGE 2019 in London. The MOU between the IAMG and EAGE has been agreed by Council and the details are currently being currently being finalized.

The IAMG also **made a financial contribution of 2500 Euros** to support the 8th International Workshop on Compositional Data Analysis (CoDaWork2019) in Terrassa (Spain). A MOU between the IAMG and CoDa has been agreed by Council and the details are currently being currently being finalized. The IAMG has committed sponsorship for the Geostatistics for Environmental Application (GeoENV) - GeoENV2020, Palma, Italy. Sponsorship and support of these organizations and meetings are a crucial part of the IAMG mandate and outreach.

The IAMG will provide support/sponsorship (\$2500 USD) to the International Applied Geochemistry Symposium that will be held from November 8-13, 2020 in Vina del Mar, Chile.

6. Chief products

The IAMG publishes four scientific journals (*Mathematical Geosciences*, *Computers & Geosciences*, *Applied Computing & Geosciences* and *Natural Resources Research*) in partnership with Elsevier and Springer. In 2018, about 140 articles were published in Computer & Geosciences. 33 articles were published in Natural Resources Research and 44 articles were published in Mathematical Geosciences.

Annually IAMG publishes two newsletters and the proceedings of its annual meeting on CD and/or book-form. It sponsors the publication of books including those in the IAMG Monograph Series in partnership with Oxford. IAMG maintains one primary public

website: <http://www.iamg.org> and contains general information including Statutes & By-Laws and Minutes of General Assemblies as well as IAMG Council meetings; the other website is for members only.

In early 2019, the IAMG partnered with Elsevier to launch a new open access journal, Applied Computing & Geosciences. This journal is similar to the IAMG journal, Computers & Geosciences, however its scope is broader and is open access only. Part of the strategy for launching the journal is based on the future requirement that publicly funded research must be published in open access journals. The initial Editor-in-Chief, is the IAMG Secretary General, Eric Grunsky.

The 1-year impact factor (IF) of 1.966 for MG for 2018. The 1 year-IF for C&G of 2.721. The first IF for NRR was 3.094 based on citations to papers published in 2015 and 2016. There are Special Issues for all four IAMG journals based on presentations at annual IAMG meetings and affiliated associations including CODA (Association for Compositional Data Analysis). A special issue will be launched for the upcoming IAGS 2020 meeting in Chile.

A recent initiative of the IAMG is the creation of the Encyclopaedia of Mathematical Geosciences that is being edited by Professor Daya Sagar, Professor Jennifer McKinley and Dr. Frits Agterberg. This special publication is a compilation of articles by experts in various field of Mathematical Geosciences. The anticipated publication date will be in 2021.

Student and postdoctoral research is financially supported by research and travel grants including the Mathematical Geosciences, Computers & Geosciences and Natural Resources Research scholarships. In 2019 there were 6 postdoctoral and postgraduate research awards, which came to a total of \$15,000 with an additional \$9,700 provided as travel grants supporting 8 postgraduate students. The IAMG also provided \$9,200 in support Student Chapters that are located around the world.

Financial support is also provided in the form of professional awards and recognition, namely, Krumbein Medal, Chayes Prize, Griffith Award, Vistelius Award, Matheron Lecturer and Distinguished Lecturer. A report on the funding provided to support these awards is pending. The 2019 Distinguished lecturer is Phillipe Renard, University of Neuchâtel, the 2019 Felix Chayes (\$7,000 USD) prize awardee is Peter Filzmoser, Vienna University of Technology, the Matheron Lecturer, Vera Pawlowsky-Glahn and Vistelius awards recipients, Alessandra Menafoglio, Politecnico di Milano and Wenlei Wang, Chinese Academy of Geological Sciences. The awards were presented at IAMG2019 where the award winners also delivered keynote presentations.

More detailed information on the IAMG and its chief products is available in the updated IAMG brochure that is available on the IAMG website (<http://www.iamg.org>).

7. Chief accomplishments in 2019 and plans for 2020

The annual IAMG conference was held in Penn State University 12-16 August. The local organising committee was chaired by Sanjay Srinivasan with sponsorship support from Aramco, the US Geological Survey (USGS), and Penn State University through the

Institute for CyberScience, Institutes of Energy and the Environment (IEE), Energy Institute and the College of Earth and Mineral Sciences. IAMG members offered short courses and our sponsors Aramco and IUGS also assisted with the early career workshop on careers in geoscience. The conference benefitted from a number of excellent invited keynotes including Susan Agar from the Aramco Global Research Centre and Lee Kump, Dean of the Penn State College of Earth and Mineral Sciences.

The focus set by the local organizing committee was to consider how mathematical geosciences can assist in addressing the global scientific challenges of the food, water, and energy nexus. Short courses organised by members and conference sessions offered the opportunity to present new advances and a chance to reflect on how far we have come in many areas such as classical geostatistics and statistics, machine learning, compositional data analysis, fractal and multifractal modelling, multiple point statistics, geoinformatics, inverse modelling, geometry and topology to name a few.

Other sessions addressed critical problem solving with mathematical geoscience with sessions topics including: geotechnical engineering; mining; unconventional oil and gas resource modelling; space-time data modelling; applied geoinformatics; geomathematics for marine geosciences; stratigraphic forward modeling and fracture characterization. IUGS President Qiuming Cheng gave an overview of the IUGS-recognized 'Big Science Program' Deep Time Digital Earth Initiative (DDE), in which the IAMG is a founding member and which will be launched at the 36th International Geological Congress in New Delhi.

Prof Hari Pandalai, the IAMG IGC Councillor for IGC2020 has been very active in ensuring that the IAMG is well involved in the 36th IGC, New Delhi, India with several IAMG sessions. The IAMG President has agreed to assist Prof Pandalai and act as a coordinator for Theme 35. Prof Hari Pandalai is currently working with Symposium Convenors for sub-themes 35A: Mineral Resource Evaluation and 35D Mathematical Geosciences. In addition to the Special IAMG Award Keynote session (Theme 45), the IAMG has also planned a joint symposium 'Geoscience Information-Integration' with the CGI-IUGS, OneGeology and CCOP. This is an opportunity to highlight new research and achievements in mathematical geoscience, geoscience information sharing and advances geoscience-related big data.

The IAMG remains committed to supporting early career scientist and to encouraging women in science. For the first time in 2019, the Vistelius Award was awarded to both a female and a male recipient and a Founders Scholarship is being set up for early career researchers. The first recipient will be awarded at the 36th ICG in Delhi.

8. Specify how any IUGS Allocation for 2019 was used

No IUGS Allocation for 2019 was requested.

9. Budget request with justification for 2020 (only applicable to low income affiliates)

No IUGS Allocation for 2020 is requested.

10. Does your website have a link to IUGS?

YES.

<https://iamg.org/links-and-datasets.html>