



INTERNATIONAL UNION
OF
GEOLOGICAL SCIENCES

2019 **REPORT**

Fostering a global voice for the geosciences

In association with ISC and UNESCO

120+ Adhering Organizations

50+ Affiliated Organizations

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IUGS

THE UNION'S AIMS

The International Union of Geological Sciences (IUGS) was founded in 1961 with the mission to unite the global geological community in promoting development of the earth sciences.

The Union is the largest member organizations (about 1 million earth scientists) of the International Science Council (ISC) and one of the world's largest scientific organizations.

Origins

2012 Strategic Plan

In 2012, IUGS redefined its missions according to a new Strategic Plan:

- Produce authoritative scientific standards
- Contribute to earth science education and public understanding of geosciences
- Represent the geological sciences in forums and decision-makers
- Encourage and support new original ideas in basic and applied geological research
- Foster collaboration between developed and developing countries in earth science research, capacity building, and applications
- Encourage more interdisciplinary involvement within the broad spectrum of the geosciences.

For the period of 2019, the Union had the following aims:

- Encourage and substantiate the participation of the Adhering organizations and National Committees in promoting Geosciences
- Develop initiatives, (i.e. Resourcing Future Generations, Forensic Geology) of wide societal and applied interest
- Renew and establish closer links to UNESCO, ISC, and Geo-Unions, as well as develop new initiatives together with these organizations
- Improve visibility of IUGS through publications and presence at scientific forums.

Present Strategic Plan

GOVERNING THE UNION

The Council

Meets every four years at the International Geological Congress

Representatives appointed by the Adhering Organizations from the active IUGS member countries/regions

Inactive or non-member countries/regions may send observers (without voting rights) to Council meetings

Executive Committee (2016-2020)

Bureau

Day-to-day decisions and responsibilities

Secretary General



Prof. Dr. Stanley FINNEY

President



Prof. Dr. Qiuming CHENG

Treasurer



Prof. Hiroshi KITAZATO

Past President



Prof. Dr. Roland OBERHÄNSLI

Vice Presidents



Dr. Kristine ASCH



Prof. William CAVAZZA

Councilors (2016-2020)



Prof. Ben MAPANI



Mr. Edmund NICKLESS

Councilors (2018-2022)



Dr. Silvia PEPPOLONI



Dr. Claudia Inés MORA

Prof. Dr. Qiuming CHENG



PRESIDENT (2016-2020)

It has been several months since the outbreak of the COVID-19 which has put the whole world at risk, has claimed hundreds of thousands lives and caused devastating social and economic consequences. I would like to express IUGS' sincere sympathy to those who have lost their loved ones and who are still suffering from the spreading of the pandemic. I sincerely thank all who have been contributing to fighting the pandemic including those who stay home or keep social distancing to protect themselves and others. Let's hope everyone stay safe and healthy and the world will return to normal sooner!

2019 was a fruitful year for IUGS and for geosciences! With the collective efforts, IUGS has made great progress in promoting frontier Earth science and the engagement and interactions of its members as well as international collaboration.

1. Progresses of IUGS New Big Science Program – DDE

IUGS has taken efforts proactively for transforming Earth science from human learning to integration of human learning and artificial intelligence, including machine-learning, as well as from answering known questions seeking unknown answers to seeking unknown questions with unknown answers. IUGS has keenly initiated the new program – Deep-time Digital Earth (DDE) based on other thematic programs supported by IUGS in cooperation with other

organizations. The DDE program was officially announced at the 73rd IUGS EC meeting held in Beijing on February 26-29, 2019. The DDE mission is to harmonize Earth evolution data and share global geoscience knowledge and its vision is to promote Earth science transformation. Unlike other existing databases, DDE will provide the geologies and geographies of Earth in time, as well as data linking multi-spheres (geosphere, biosphere, hydrosphere and atmosphere), and thus will provide insights into the co-evolution of Earth life, materials and environment (atmosphere and geography) and occurrences and impacts of major transformational and extreme geological events including distributions of Earth's resources and hazards (Figure 1). Deep-time Earth issues targeted in DDE program are contemporary Earth science issues as reflected by the newly released Earth in Time, a Vision for NSF Earth Sciences 2020-2030 by National Academies of Sciences, Engineering, and Medicine (2020).

The program not only motivates the engagement and interaction of IUGS members including national members, constituent groups and affiliated international associations, but also facilitates broad collaboration with other international organizations including ISC, UNESCO and the other members of ISC-GeoUnions. The DDE program after it commenced a year ago has already generated global interest and broad publicity as being highlighted by several websites and journals such as SCIENCE.

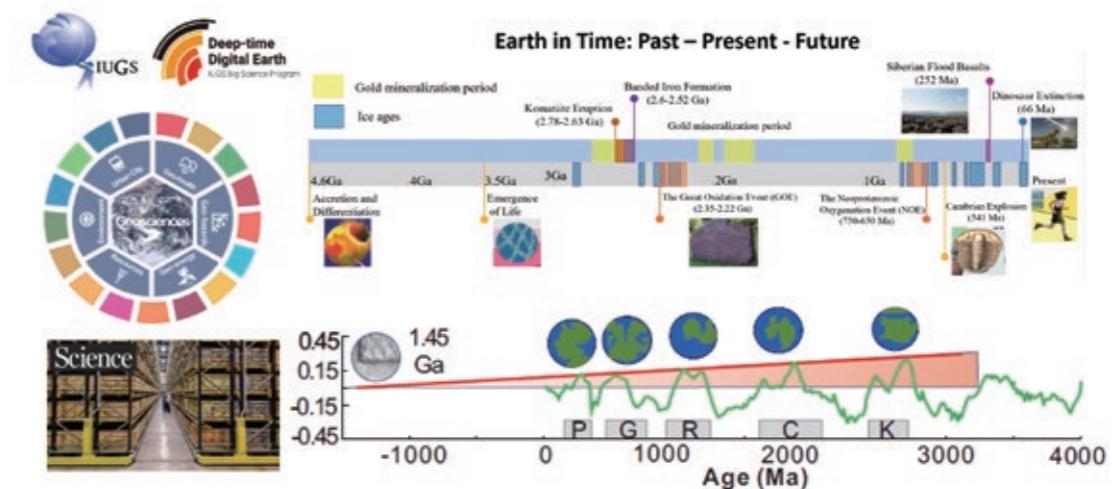


Figure 1. Issues addressed by geoscientists are closely related to the UN 2030 Sustainable Development Goals. DDE provides digital earth linking multi-spheres of earth systems for supporting discovery of earth evolution and major transformational and extreme geo-events. DDE was reported by SCIENCE on the day of the DDE Forum.

1.1 Initiative of the IUGS Big Science Program received Broad International Supports

Open science, data-driven science and interdisciplinary research have become core topics in the IUGS and ISC Action Plans as well as the UN Sustainable Development Goals (SDGs). In view of facilitating efficient utilization of geoscience data for transforming traditional approaches in conducting research in frontier Earth science, at the 72nd IUGS EC meeting held in Potsdam Germany in January 2018, President Qiuming Cheng proposed to establish IUGS Big Science International Programs and Centers of Excellence, which aim to increase public awareness and education, international collaboration, open data sharing, and transdisciplinary research. International collaborations were called among IUGS members including adhering national committees and affiliated international associations and other international organizations. The primary areas of consideration include, but are not limited to, (i) integration of data sciences and Earth science focusing on

major Earth science questions such as co-evolution of Earth life, materials and environments and effects of converging plate boundary dynamics on natural resources, environment, hazards and human resilience, (ii) big data discovery for resources assessments (mineral resources and water resources) on the African continent, and (iii) predictability of extreme geological events such as earthquakes, volcanoes and landslides. Over the past several years, President Cheng and his team took all opportunities of attending numerous conferences and other occasions to promote new IUGS initiatives which have attracted a broad interests and international supports. For example, President Cheng introduced the IUGS initiatives at

- ◇ the council meeting of the Geological Society of America (GSA);
- ◇ the 24th council meeting of the Association of Iberoamerican Geological and Mining Surveys (ASGMI), which was attended by the leaders of 22 geological surveys;
- ◇ the Session on "Changing Role of Geological



Surveys" at the RFG2018 conference attended by several national geological surveys (GSC, USGS, BGR, BGS, Japan, Finland, Norway, Australia etc.);

◇ a follow-up meeting of the International Consortium of Geological Surveys (ICOGS) organized at the Prospectors and Developers Association of Canada (PDAC) Convention by GSC and USGS for directors and representatives of geological surveys attended by about 20 delegates from Australia, New Zealand, South Africa, Afghanistan, USA, Tasmania, France, Germany, Republic of Senegal, the Organization of African Geological Survey (OAGS), and EuroGeosurveys;

◇ Sessions of Directors of Geological Surveys at the China Mining Conference and Exhibition attended by directors of several geological surveys and Ministries of Mines including OAGS, an organization that comprises Geological Surveys of 54 nations in Africa.

Through these activities, President Cheng has consulted and interacted with most of the adhering members including US National Academy of Science, Indian Academy of Science, and most of the geological surveys. Besides the adhering members, the IUGS initiatives have been presented to affiliated members and other international organizations at their annual conferences, council meetings and celebrations such as

- ◇ IUGG 100th annual celebration,
- ◇ IAMG 50th annual celebration,
- ◇ EGU General assembly,
- ◇ AGU annual meeting,
- ◇ CGMW general assembly,
- ◇ IODP council,
- ◇ International Paleontological Association

(IPA),

- ◇ International Association of Sedimentologists (IAS),
- ◇ IGCP council meetings,
- ◇ Alliance of International Science Organizations (ANSO),
- ◇ International Consortium on Landslides (ICL),
- ◇ Int. Society of Soil Mechanics & Geotechnical Engineering (ISSMGE),
- ◇ Int. Association for Engineering Geology and the Environment (IAEG).

The IUGS initiatives were also discussed with ISC, UNESCO and the GeoUnions. A test bed topic on Deep Earth (Deep understanding of Deep past to the future of the Earth - DDE) was proposed by President Qiuming Cheng at the General Assembly of ISC in Paris on July 1, 2018. The main effort was to convince organizations to collectively develop proposals for establishing IUGS big science programs with the primary objective of sharing new knowledge and developing cutting-edge technology to tackle global issues, as well as solving current problems facing numerous countries. An article titled "A New International Initiative for Facilitating Data-Driven Earth Science Transformation" authored by President Cheng and Past President Roland Oberhänsli and published by Geological Society of London (GSL) elaborates on the details of the rationale and evolution of the initiative.

1.2 Successful Kick off Deep-time Digital Earth (DDE)

The idea of the IUGS Big Science Program was first presented at the IUGS Bureau meeting held in Vancouver in conjunction with the RFG2018. Following up on the Bureau's comments a

IUGS President's Report for 72th IUGS EC

January 21-27, 2018 Potsdam

Qiuming Cheng

This annual report (February 2017 – January 2018) provides a summary of the main activities of President Cheng in two sections: 1. Business meetings and activities and 2. New Initiatives and suggestions. The first part mainly

- 1 Global and major issues
- 2 International collaboration
- 3 Transdisciplinary
- 4 Global – Free – Open – Sharing - Service
- 5 Collaboration with ISC, UNESCO etc.
- 6 Promotion in underrepresented nations



Figure 2. Proposal for the IUGS Big Science Program and the center of excellence was presented at the 72nd IGC EC meeting held in Postam January 2018 (left). A topic of Deep Earth (Deep Understanding of Deep past to the future of the Earth – DDE) was proposed by President Cheng at the General Assembly of newly formed ISC in Paris July 1, 2018. Leaders of several GeoUnions presented at the ISC SG (right).

formal proposal of the DDE was jointly developed by Qiuming Cheng, Roland Oberhänsli, Chengshan Wang and others in consultation with several IUGS bodies including Commissions, Adhering Committees and Affiliated Organizations. After a second review of the Bureau meeting held in Japan in November, the final proposal was submitted to the entire IUGS EC for discussion in December. The proposal was unanimously approved by IUGS EC by electronic vote on December 24, 2018. The EC also voted to hold the DDE Forum jointly with the 73rd IUGS EC Meeting in Fragrant Hill Hotel in Beijing February 26-29, 2019. The DDE program was officially announced and kicked off at the DDE forum (Figure 3). The event was attended by more than 250 scientists including about 30 Chinese Academicians and more than 80 world's top scientists from over 40 international organizations. The ISC, UNESCO and several GeoUnions (IUGS, IUGG, IGU, ISPRS,

ANQUA) sent representatives to the DDE Forum. So far 17 organizations have signed as founding members at the time when this report was prepared. These members include five national members of IUGS (BGS, CGS, GSC, KIGAM, VSEGEI), ten affiliated or associated international associations (CGMW, AAPG, IAMG, CCOP, IAG, IAS, IAGOD, IPA, ILP, FBGU) and two IUGS commissions (ICS and CGI). DDE keeps open for new members to join. DDE has been set as a 10-year international big science program (2019-2028) with milestones anticipated at subsequent International Geological Congresses (36th IGC in New Delhi 2020, 37th IGC in Busan 2024, and 38th IGC 2028).

1.3 Governing Structure of DDE for Internationalization

To facilitate the development of the DDE program, an ad-hoc Steering Committee was established which is chaired by President Qium-



Figure 3. The 73rd IUGS EC meeting and the DDE forum were jointly organized in the Fragrant Hill Hotel, Beijing, February 26-29, 2019. President Qiuming Cheng announced the DDE program (upper left). About 250 scientists attended the event (upper right). Members signed ACCORD on the stage (lower left); three scientists (Michael Stephenson, Roland Oberhänsli and Chengshan Wang) were appointed to lead on the development of the program; and LOGOs of the first set of DDE founding members (lower section).

ing Cheng and includes Michael Stephenson, Roland Oberhänsli, Chengshan Wang and Junxun Fan. This committee has bi-weekly video meetings as well as an annual meeting in-person. Under the guidance of the Steering Committee, DDE has made tremendous progress both in terms of program structure, infrastructure construction and collaborative projects (Figure 4).

DDE Board. The responsibilities of the board include giving advice on DDE's strategic aims and challenging and supporting the management of DDE. The value of the Board will be in providing DDE with good governance and thus credibility in the international arena.

The Governing Council, consisting of the authoritative representatives from the 17 founding members chaired by Michael Stephenson, is established. The Governing Council (GC) provides governance, financial and scientific overview, makes major policy decisions and reviews the acceptance of new members for the program. The GC will have its first meeting at the 36th IGC.

The Science Committee of DDE, consisting of 17 world's top scientists covering various fields of Earth science and chaired by Roland Oberhänsli, has been set. The Science Committee (SC) is an independent body of internationally

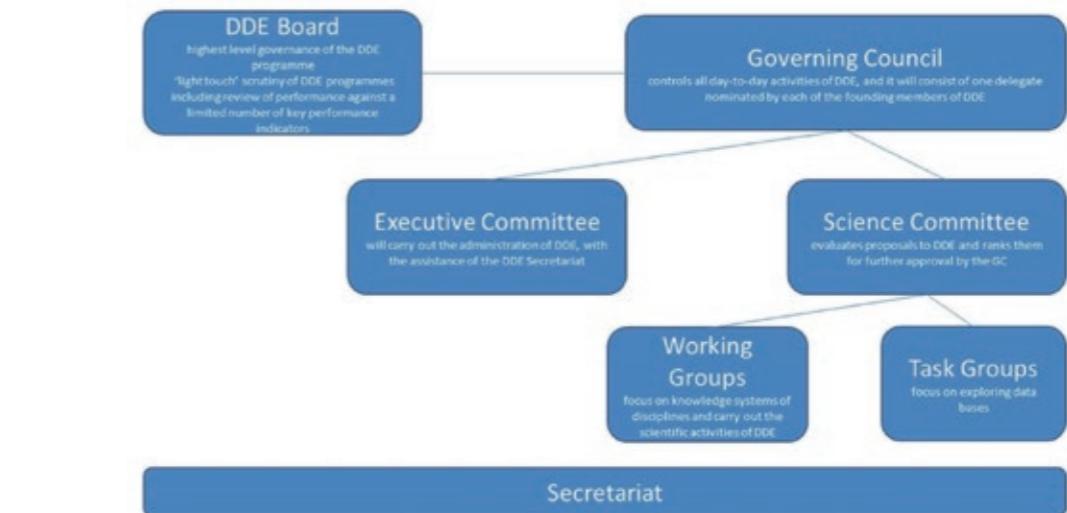


Figure 4. Governing structure of DDE program (Stephenson et al., *Episodes*, 2020).

renowned experts in research fields related to DDE. It provides scientific evaluation of competing proposals submitted to DDE and provides a priority list to the DDE GC. The SC successfully had its first meeting in Busan in conjunction with the 74th IUGS EC meeting (Figure 5).

The Executive Committee of DDE has been

established and chaired by Chengshan Wang. The Executive Committee (EC) manages the activities and reports annually to the GC on the past year's operational activities providing a budget report and a summary of scientific accomplishments.

DDE pilot collaborative projects are devel-



Figure 5. IUGS EC members at the 74th EC meeting in Busan, Korea, January 14-18, 2020 (left); and members at the first DDE Science Committee meeting in conjunction with the 74th IUGS EC meeting in Busan, Korea, January 19-20, 2020 (right). The members of DDE SC include: Roland Oberhänsli (Germany), Danis Nurgaliev (Russia), Dietmar Müller (Australia), Guy M. Narbonne (Canada), Hans J. Thybo (Denmark), Harsh Gupta (India), Kathryn Whaler (British), Kiyoshi Suyehiro (Japan), Muhammad A. Khan (Pakistan), Nicholas Arndt (France), Robert M. Hazen (America), Shanan E. Peters (America), Sierd Cloetingh (Netherlands), William Cavazza (Italy), Zengqian Hou (China).



Figures 6A (Cheng et al., GSL, 2020) Integration of DDE in supporting data-driven knowledge discovery: integrating main components of data, model, algorithms, data mining processes, computer network and people (middle) and DDE data linking various Earth spheres demonstrating co-evolution.

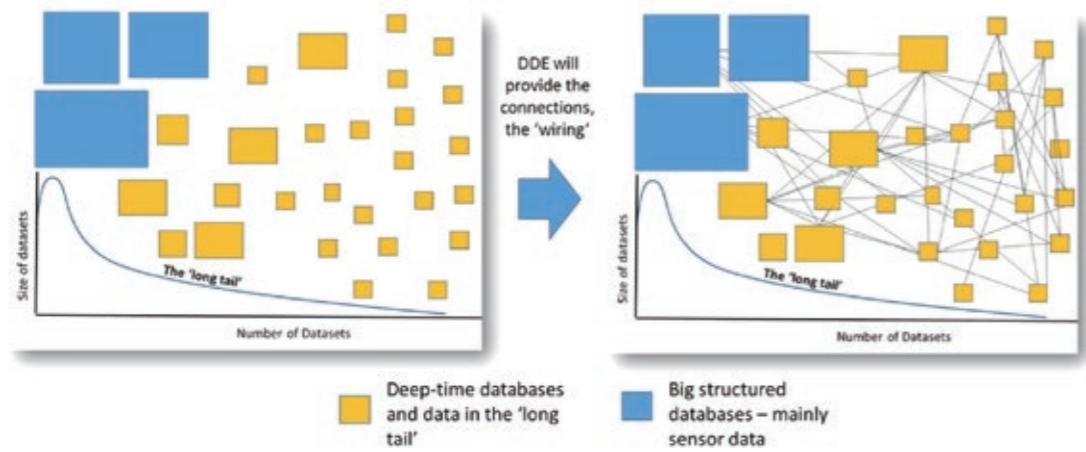


Figure 6B (Stephenson et al., Episodes, 2020) DDE New protocols, platforms and programs are needed to secure compatible and interoperable databases and link the vast amounts of existing (and new) deep-time geoscience data.

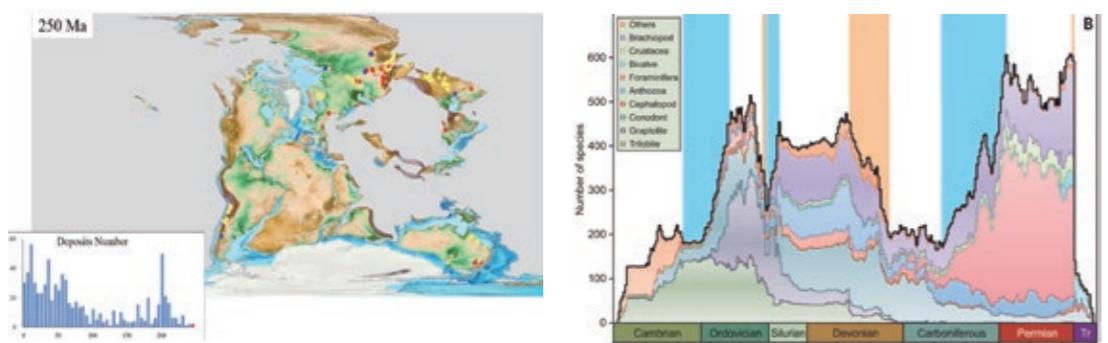


Figure 6C (left: Cheng, Acta Geologica Sinica, 2019). DDE link georeferenced databases and models to be used more efficiently for example in the study of porphyry copper mineral deposits. Figure (right: Fan et al., Science 367, 2020) high resolution profiles for Paleozoic species diversity and 10 major fossil groups.

oped jointly by DDE and its founding members "Data Driven Earth Science Knowledge Graph" by DDE, CGI and CODATA; "a 5-million Scale Global Geological Map" by CGMW, CAGS and DDE; "New Geological Time Scale and Chart" by ICS and DDE; "Eurasian Marginal Seas Study: past and future" by IAMG and DDE; and "DDE – Geological Survey" by DDE and China Geological Survey.

1.4 Publications and Outreach of DDE

Progresses have been regularly updated in the IUGS E-Bulletins and several scientific and outreach publications (Figure 6). A full-length white paper is currently in its final stage of preparation which will appear late the year which will provide a document of main principle and activities of DDE. More information about the DDE can be found at the DDE website www.ddeworld.org.

2. Business meetings and interaction with other international communities

2.1 Bureau meetings and EC meetings

During 2019 three bureau meetings and one EC meeting were organized in places chosen to maximize the interactions of IUGS EC and IUGS bodies with local, regional, and international communities.

Bureau meeting

Bureau meetings were held in Beijing, February 26; New Delhi, May 18; Saint Petersburg October 20-21, 2019. These meetings were attended by Qiuming Cheng -President, Stan Finney -Secretary General, Hiroshi Kitazato -Treasurer, Roland Oberhänsli -Past President, William Cavazza -Vice President, and Kristine Asch -Vice President. In New Delhi and Saint Petersburg, Bureau members had a chance to interact with the local organization committee of the 36th

IGC and the Russian communities who considered to propose for hosting the 38th IGC, respectively.

73rd EC Meeting in Beijing

In addition to the ordinary IUGS EC meeting, started in 2019, the IUGS EC meetings have been hosted in conjunction with a scientific forum (e.g., DDE forum) to facilitate interactions and collaboration of IUGS EC with its members and other organizations. This new form of IUGS EC meeting may increase the attendance of the IUGS EC and the visibilities of IUGS especially in leading frontier science and in underrepresented areas. The 73rd EC meeting was held jointly with DDE Forum in February 26-29, 2019 in Fragrant Hill Hotel, Beijing, China. The EC meeting was attended by more than 60 representatives of over 40 IUGS associated organizations. The meeting was co-sponsored by the China Geological Survey (CGS) and the Natural Science Foundation of China (NSFC). The IUGS Secretariat together with China University of Geosciences (Beijing) (CUGB) and China Academy of Geological Sciences (CAGS) provided logistic and manpower supports. Several deputy directors general of CGS (Kun Wang, Pengde Li, and Guangsheng Yan) participated in both the IUGS EC meeting and DDE forum and delivered welcome addresses at the opening and plenary sessions. The leaders from Ministry of Natural Resources, Ministry of Education and NSFC delivered speeches at the opening of the DDE forum. The event provided an excellent opportunity for interaction and international collaboration.

2.2. IGCs and IGCC

The IGC Committee (IGCC) members comprising Prof. Qiuming Cheng (Co-chair), Prof. V.P. Dimri (Co-chair), Dr. Rasik Ravindra (Secretary



Figure 7. IGCC members met in New Delhi May 20, 2019 (top); during the bureau meeting in Saint Petersburg October 21-22, 2019, IUGS Bureau members exchanged with Russian representatives who proposed a bid for host the 38th IGC in Saint Petersburg (low left); and IUGS EC met the LOC of the 37th IGC during the 74th IGC EC meeting held in Busan, January 14-18, 2019 (low right).

General), Stanley Finney, Hiroshi Kitazato, Greg Botha, Prof. William Cavazza (observer), and Dinesh Gupta (observer) had a meeting on May 20, 2019 in New Delhi. Among other items on the agenda, the IGCC reviewed the current IGC Statutes and Bylaws ratified at the 34th IGC in Brisbane 2012. According to the new status and bylaws, IGC serves as the international scientific forum of the IUGS and serves as a scientific forum for other geoscience organizations as appropriate. During its stay in New Delhi, the delegation visited the venue of the Congress and met the Executive Committee and the Local Organizing Committee of 36th IGC and interacted with the leaders of the hosting ministries (MoM - Ministry of Mines, MoES - Ministry of Earth Science, and INSA - India Science Acad-

emy) (Figure 7). IGCC contributed valuable suggestions to the host of 36th IGC especially about the preparation processes considering the Congress to be held in March (due to pandemic it has been postponed when this report is written). Various IUGS business meetings including IUGS-IGC Joint Council Meeting have been scheduled at the 36th IGC.

The IUGS EC met the LOC of the 37th IGC and visited the venue of the congress during the 74th EC meeting held in Busan, Korea, January 14-18, 2020.

At the invitation of Dr. Oleg Petrov, Director of the A. P. Karpinsky Russian Geological Research Institute (VSEGEI), a Bureau meeting was held at VSEGEI in Saint Petersburg, Octo-



Figure 8. Professor Alik ISMAIL-ZADEH, ISC Secretary, to address delegates at the opening of the DDE Forum on February 27, 2019 (left). ISC CSP members met at ISC headquarter, Paris, January 29, 2020 (right).

ber 21-22, 2019. The bureau members had an exchange with a delegation of Russian geoscientists including leaders of the Russian National Committee of Geologists, Directors General of national geologic institutes, members of the Russian Academy of Sciences, the President of the Russian Geological Society, the Director of Earth Sciences at St. Petersburg State University, and a representative of the Governor of St. Petersburg. VSEGEI has formally submitted a proposal for the Russian bid to host the 38th IGC in Saint Petersburg in 2028. So far Russian bid is the only one received for hosting the 38th IGC. The decision will be made by the IUGS-IGC council.

2.3. ISC and UNESCO

ISC

IUGS President Qiuming Cheng was elected as a member of the ISC Committee of Science Planning (CSP) (2019-2021). At the first CSP meeting held in Paris on January 29, 2020, the CSP has reviewed the draft of "SCIENCE CREATING SOLUTIONS", ISC Science Action Plan: 2019-2021. The CSP has also reviewed the

priorities of projects in four strategic challenge domains (The 2030 Agenda for Sustainable Development, The Digital Revolution, Science in Policy and Public Discourse, and The Evolution of Science and Science Systems). President Cheng introduced the IUGS DDE initiative in relation to all four priority areas of ISC's strategic challenge domain. President Cheng suggested to develop a joint project on Data Driven Science for Sustainable Development Transformation. IUGS appreciates the support of ISC who sent its governing member Professor Alik ISMAIL-ZADEH, ISC Secretary, to address delegates at the opening of the DDE Forum in Beijing on February 27, 2019.

UNESCO

The relationship of IUGS with UNESCO was strengthened with participation of IUGS in aspects of the UNESCO Global Geoparks Program and by its continued major financial support of, and participation in, IGCP. In addition to the funding from IUGS and UNESCO, funding from China and Korea sustains and increases the number of IGCP projects granted each year so as to increase the number of researchers



Figure 9. IUGG greets leaders of associated organizations at the IUGG 100th anniversary celebration at the UNESCO headquarter, Paris July 29, 2019.



involved, especially young researchers and female researchers as well as the number of countries. In the video speech at the opening session of IGCP Council meeting held on February 20, 2019 in UNESCO headquarter, President Cheng welcomed the three new council members joining IGCP administration. President Cheng has visited the UNESCO headquarter twice a year for the past few years and he appreciates the opportunity to meet and exchange ideas with Dr. Flavia Schlegel and Dr. Shamila Nair Bedouelle (former and current ADG of UNESCO) and Dr. Patrick Mc Keever and Dr. Kristof Vandenberge (former and current Chief of Section of UNESCO Earth Sciences and Geo-Hazards Risk Reduction, the IGGP Secretary). UNESCO sent its representative Dr. Özlem ADIYAMAN, to give an address at the opening of DDE Forum in Beijing. IUGS is looking forward to further collaborating with UNESCO on the DDE and other programs.

2.4. ISC GeoUnions

The Presidents and Secretary Generals of ISC-GeoUnions met at the IUGG's 100th Anniversary in Paris on July 29, 2019 and had a GeoUnions meeting afterward at the ISC head-

quarter on July 30, 2019 (Figure 9). The main objective of the meeting was to explore collective efforts to propose new initiatives in line with strategic challenge domains identified by ISC. Pertinent topics include Deep-time Digital Earth, geo-education, and geo-hazards. Upon the invitation of President Qiuming Cheng, representatives from five GeoUnions members (IGU, ISPRS, ANQUA, IUGG and IUGS) attended the DDE forum in Beijing and offered constructive suggestions in supporting the DDE initiative. Further development of joint initiatives is in progress.

3. Other Activities

3.1. Interaction with IUGS affiliated Associations at Conferences 20th IAMG Annual Conference

In his plenary presentation at the opening of the 20th IAMG Annual Conference, held in USA on August 10-16, 2019, Qiuming Cheng discussed opportunities and major roles of mathematical geosciences and data science in contributing to digital Earth science transformation. IAMG and DDE are intended to establish a joint research project on Eurasian Marginal Seas Studies.

International Conference on Silk-roads Disaster Risk Reduction and Sustainable Development (SiDRR)

Qiuming Cheng was invited to deliver a speech at the Closing Ceremony of Int. Conference on SiDRR on May 11-12, 2019 in Beijing. SiDRR Conference 2019 has attracted about 780 experts from more than 40 countries including senior representatives from UNEP, UNDRR and UNESCO, over 20 presidents/vice-presidents of internationally renowned societies, and over 50 leaders from universities and research institutes. President Cheng called for the full use of relevant Earth and space science and engineering technology as well as modern digital technologies. President Cheng pointed out several groups of IUGS are dedicated to research supporting Disaster Risk Reduction especially geohazards originated disasters such as earthquakes, landslides, volcanic eruption, tsunami, floods, and glaciers, etc. He further introduced the efforts and supports of IUGS to facilitate the implementation of Sendai Disaster Risk Reduction Framework launched by United Nations in 2015. Qiuming Cheng expressed his gratitude to the participants and sponsors of the conference including IUGS Task Group on Geohazards (TGG) and several IUGS Affiliated Members of International Associations: Int. Consortium on Landslides (ICL), Int. Society of Soil Mechanics & Geotechnical Engineering (ISSMGE), Int. Ass. for Engineering Geology and the Environment (IAEG), and IAMG.

3.2. Interaction with leaders of Geological Surveys

President Qiuming Cheng participated in and delivered presentations at several sessions for

Directors of Geological Surveys at the 21st China Mining Congress and Exhibition in Tianjin and the Prospectors & Developers Association of Canada (PDAC 2020) in Toronto, respectively. On these occasions President Cheng interacted with the leaders of geological surveys and associations of geological surveys including CCOP, EuroGeoSurveys, ASGMI and AOGS. He has also visited and exchanged ideas with the leaders of several Geological Surveys (GSC, CGS, VSEGEI, KIGAM, and Geological Survey of India-GSI). With his invitation, five geological surveys have confirmed to join DDE as founding members.

3.3. Communication with other IUGS constituent groups

To demonstrate the benefits and essentiality of joining DDE, President Qiuming Cheng had meetings with the executives of several IUGS constituent groups for exploring possibilities to set up joint projects. Five projects are under development with CGI and CODATA, CGMW, and ICS. More organizations and research teams are invited and encouraged to collaborate with DDE.

To end this report, once again, I would like to thank all those who have made generous contributions to support IUGS and to Earth science. Without international collaboration and supports, it would be impossible for any significant progress. Given the impact of the COVID-19 pandemic on physical communication and social and economic conditions, scientists need to work even harder to support science, to participate and to collaborate on big science program.



Prof. Dr. Stanley C. FINNEY



SECRETARY GENERAL (2016-2020)

The year 2019 was especially busy for the Secretary General of the IUGS. Major activities included the annual IUGS Executive Committee Meeting held in Beijing, a meeting of the International Geological Congress Committee (IGCC) and an IUGS Bureau meeting in India, and an IUGS Bureau meeting in St. Petersburg. In addition, the Secretary General participated in a meeting of the IUGS Publications Committee in Vienna, Austria, and represented the IUGS EC at STRATI 2019 - the 3rd International Congress on Stratigraphy in Milan, Italy. The year ended with focused preparation for the 2020 IUGS EC meeting in Busan, Korea in January 2020 and the 36th IGC in Delhi, India in March 2020.

The 2010 IUGS EC meeting in Beijing, China, 27 February - 2 March, was held in conjunction with the kickoff celebration of the Deep-time Digital Earth (DDE) program, the first IUGS-recognized International Big Science Program. Besides setting the agenda for this meeting, the Secretary General was also responsible for many of the resulting action items. As always, the most pressing item from the EC Meeting was to inform all IUGS constituent groups (Commissions, Task Groups, Initiatives, and Joint Programs) of annual budget allocations and of specific recommendations and commendations from the EC. Affiliated organizations that requested financial support also are informed of allocations and also of specific recommenda-

tions from the EC. Those submitting proposals for a new Commission and a new Task Group were informed of decisions by the EC.

Several Action Items from the Beijing EC meeting involved preparations for the 36th IGC. Most important were IUGS awards to be presented at the 36th IGC and Hutchison Fund travel awards to support the attendance at the Congress of early career geoscientists. Preparation and management of all aspects of the awards required attention from the Secretary General throughout 2019, and the work was most rewarding with three distinguished scientist selected for recognition with IUGS Medals at the 36th IGC: the Émile Argand Award, the James M. Harrison Distinguished Service Award, and the Early Career Award. New Terms of Reference for the awards were written and approved. The Secretary General then designed and outsourced production of high-end medals; wrote and sent out the Call for Nominations for the awards and for Experts to serve on Evaluation Panels to all IUGS adhering organizations and to leaders of all IUGS Constituent groups; and place the Calls prominently in all IUGS media. The Secretary General managed the correspondence with the nominators and the expert panels and the final vote of approval of the awardees by the EC. The Secretary General wrote award letters and prepared announcements of the awardees for publication in the

IUGS E-Bulletin and for posting on IUGS Social and the IUGS website. Finally, the Secretary General arranged for photos, citations, and responses for each award to be published in Episodes. In addition, the Secretary General managed the selection process of recipients of Hutchison Fund travel awards. Announcement of the funds and the application process was widely distributed in all IUGS media outlets. The Secretary General received more than 80 applications, acknowledged receipt of each one, and following the deadline forwarded applications to the IUGS evaluation panel. Following approval of the panel's funding decisions, the Secretary General informed each of the 15 recipients of their awards, and informed all those who were not successful.

Planning for the 36th IGC advanced further at the Bureau Meeting in New Delhi on 18 May. The Bureau Meeting and a meeting of the IGCC on 20 May dealt with all matters related to the Congress in Delhi. The nature, schedule and location of all IUGS activities, the technical program, registration, visa applications, and transportation to venue were addressed at length. So too were hotel accommodations and registration for EC members and recipients of IUGS awards. Plans were made for an IUGS reception and for IUGS awards presentations at the Opening Ceremony of the Congress. The warm, supportive reception by the members of the Local Organizing Committee of the 36th IGC made the meetings most productive and the visit to India most welcoming and supportive.

The Secretary General drafted the Call for bids for the 38th IGC for review and signing by the President of the IUGS and the President of the IGCC. The Secretary General also oversaw the preparation of the MoU for the 37th IGC, which

is to be signed at the 36th IGC.

The Secretary General arranged for the Russian Geological Institute (VSEGEI) to host the IUGS Bureau Meeting in St. Petersburg, 20-21 October. The highlight of the St. Petersburg meeting was the presentation of the Russian bid to hold the 38th IGC in August 2029 in St. Petersburg. The bid was discussed at a joint meeting of the IUGS Bureau and the National Committee of Geologists of Russia with participants from the Ministry of Natural Resources and Ecology of the Russian Federation and the Government of St. Petersburg. The Bureau Members were given a guided tour of the modern exhibition/convention center, enjoyed a wonderful reception with Russian colleagues, and were hosted to an evening concert by the Mariinsky Orchestra. The visit was memorable. The Bureau Meeting focused on plans for the 36th IGC and for the 2020 IUGS EC meeting in January in Busan, Korea. Action was taken to implement the IUGS Special Funding Program (2020-2022) that had been approved by the EC. The Call for Proposals was to be released on 10 November 2019. All IUGS activities at the IGC were reviewed and finalized. Those still needing attention were assigned to the Secretary General. The Secretary General reported on production of medals for the IUGS awards, planning for the IUGS reception at the IGC, and the agenda for the IUGS-IGC Council at the IGC. The Secretary General also prepared and distributed to all candidates for positions on the EC for 2020-2024 a template for preparation of a biography and statement for posting on the IUGS website and announcing to all IUGS adhering organizations.

In preparation for the 36th IGC, the Secretary General prepared the Report of the IUGS



Secretary General Regarding the Administration of the International Union of Geological Sciences for the Period 2016 to 2020. It was forwarded to all Adhering Organizations in early December. The Secretary General also prepared a preliminary agenda for the Fifth Joint IUGS-IGC Council Meeting at the 36th IGC and forwarded it to all Adhering Organizations with a call for amendments and resolutions.

The Secretary General enjoyed working with all IUGS constituent groups during 2019 being in frequent contact with calls for reports; solicitations of contributions for the IUGS Annual Report, Brochure, E-Bulletin, and social media; calling attention to need for election of offices and voting members for 2020-2024; calling for 4-year reports for the IUGS-IGC Council; promoting activities at the 36th IGC; explaining advanced 2020 budget allocations to support those activities; announcing the IUGS Special Funding Program; and overseeing the submission and evaluation of proposals to that program.

The Secretary General managed several votes of the EC by email. Most visible were a vote to ratify the GSSP proposal for Hauterivian Stage of the Cretaceous System and seven Global Heritage Stone Resource proposals.

The Secretary General edited a new IUGS Brochure and the IUGS 2018 Annual Report.

The IUGS Publications Committee met in Vienna, Austria on 7 April. The Secretary General attended to represent the EC and notes with satisfaction the wonderful work overseen by PC Chair Lola Pereira and carried out by Jin-Yong Lee, the editor of Episodes, by Giuseppe Di Capua, the IUGS webmaster, and by Gurmeet Kaur, who manages IUGS social media. I include with them Silvia Peppoloni, the editor of the IUGS E-Bulletin. Together these four have completely rejuvenated IUGS publications and media outlets that were in serious disarray when the present EC began its term in 2016. To see all parts of IUGS publications and media outlets working well is most satisfying.

With special satisfaction the Secretary General represented IUGS at STRATI 2019 - the 3rd International Congress on Stratigraphy, which was held in Milano, Italy, 2-5 July. While was I Chair of the IUGS Commission on Stratigraphy, I arranged for the Commission to sponsor STRATI 2013 - the 1st International Congress on Stratigraphy in Lisbon and STRATI 2015 in Graz, Austria. With the success of STRATI 2019, the International Congress on Stratigraphy, sponsored by the IUGS Commission on Stratigraphy, is now the premier international meeting for stratigraphers worldwide.

2019 was a most eventful, busy, and rewarding year working to serve the IUGS and all of its constituents.

Prof. Dr. Hiroshi KITAZATO



TREASURER (2016-2020)

General Financial Situation of IUGS

During the period from 01/01/2019 to 31/12/2019, IUGS' income and expense are USD 496,303.42 and USD 579,104.88 respectively, the net income of USD -82,801.46. IUGS current account USD 639,706.13 includes the amount of Hutchison Award, Russia Reserve and IUGS Awards (USD 75,520.17). It is noteworthy that three countries, Philippines, Portugal and Argentina became IUGS active members.

The table below reflects more detailed information of the financial situation during the recent four years.

	(USD)		
	revenue	expenditure	net income
2019	496,303.42	579,104.88	-82,801.46
2018	605,233.43	418,611.07	186,622.36
2017	494,755.49	401,008.60	93,746.89
2016	597,039.88	499,247.90	97,791.98

Description of income

The total income we received is USD 496,303.42, including USD 374,522.79 for membership dues.



The table below reflects more detailed information of expenditure situation in 2018 and 2019.

Income	2019		Amount (USD) 2018	
Membership Fees		374,522.79		428,978.28
For 2017 & 2018	8,494.90		18,775.49	
For 2019	365,455.98		410,202.79	
For 2020	571.91			
Contribution from UNESCO		118,080.22		61,364.36
Final payment for 2018	13,436.22			
1st payment for 2019	74,711.91		39,931.90	
2nd payment for 2019	29,932.09		21,432.46	
35th IGC Capitation Fee		0.00		108,581.15
1st payment	0.00		80,138.20	
balance payment	0.00		28,442.95	
RFG 2018 Capitation Fee		0.00		1,797.34
Other Income* ¹		3,700.41		4,512.30
Total Income		496,303.42		605,233.43

* 1 Other income includes royalty and bank interest

Status of Countries by Fees Category – 2019

Category	Active	Inactive	Total	Number of Countries paid for			
				2019	2018	2017	2016
1	21	49	70	10	3	2	-
2	13	4	17	11	2	1	-
3	13	3	16	11	1	-	-
4	7	1	8	6	-	-	-
5	-	-	-	-	-	-	-
6	2	-	2	2	-	-	-
7	4	-	4	4	-	-	-
8	5	-	5	4	-	-	-
Total	70	52	122	48	6	3	0

Description of Expense

The total expense is USD 579,104.88, including USD 46,154.43 paid for the followings.

Advanced 2020 Allocation USD 31,200.00

ISC for 2018 USD 12,954.43

ICS for 2018 USD 2,000.00

The table below reflects more detailed information of expenditure situation in 2018 and 2019.

Expense	(USD)	
	2019	2018
IGCP	185,346.80	134,442.17
Joint Programmes	20,592.00	20,685.00
IUGS Commissions	112,600.00 ^{2*3}	66,500.00
IUGS Task Groups	16,600.00 ²	9,500.00
Initiatives	14,400.00 ²	38,000.00
Committees	27,808.07	12,213.15
Affiliated Organizations	29,200.00	31,300.00
Contributions	26,168.32 ⁴	0.00
Episodes	28,329.00	28,346.00
Hutchison Award	18,000.00	0.00
Secretariat expense	15,000.00	15,000.00
Russian Reserve expense	6,486.74	6,724.37
ODE	784.13	0.00
IGC Special expense	33,984.00	0.00
Other expense	43,805.82 ⁵	55,900.38
Total Expense	579,104.88	418,611.07
Net Income	-82,801.46	186,622.36

*2 includes USD 31,200.00 paid for 2020

*3 includes USD 2,000.00 paid for 2018

*4 includes USD 12,954.43 paid for 2018

*5 includes USD 508.63 paid for 2020



Mr. MA Yongzheng



PERMANENT SECRETARIAT

The IUGS Secretariat is hosted within the premises of the Chinese Academy of Geological Sciences (CAGS) under the China Geological Survey, the Ministry of Natural Resources of China. Since the relocation of the Secretariat to Beijing in December 2012, the Chinese government has been providing tremendous and stable financial and logistical support for the smooth operation of the Secretariat.

Under the guidance of the IUGS Bureau and Executive Committee, the Secretariat has maintained professional and efficient operation in line with its duties, and played an active role of communication and coordination in the scientific activities and daily administration of IUGS.

In 2019, the Secretariat assisted in the organization of several regular administrative meetings, including the 73rd EC Meeting and DDE Forum (Beijing, China from February 26 to March 2, 2019) and three Bureau Meetings (Busan, South Korea on 14-18 January 2020; New Delhi, India on 18 May 2019; St. Petersburg, Russia on 21-22 October 2020).

In order to increase the visibility and influence of IUGS in the international geoscience community, the Secretariat arranged and manned IUGS booth exhibitions at several major international events, including the EGU General Assembly 2019 in Vienna, Austria (April 7–12, 2019), GSA 2019 Annual Meeting in Phoenix, U.S.A. (November 13-17, 2019), China Mining Conference & Expo in Tianjin, China (October 9-11, 2019), and AGU 2019 Fall Meeting in San Francisco, U.S.A. (December 9-13, 2019). At the above events, the Secretariat staff displayed and distributed IUGS brochures and other promotional items.

The Secretariat made extensive preparations for the 36th International Geological Congress. The Secretariat distributed a call for Expression of Interest to host 38th International Geological Congress, 2028, a call for nominations of IUGS Awards and a call for applications for support from IUGS Hutchison Young Scientists Foundation to attend the 36th IGC. The Secretariat assisted Chair of Nominating Committee (NC) in distributing a call for nominations of the next IUGS EC and Nominating Committee. The Secretariat prepared for the IUGS meetings and activities during the 36th IGC, including the 5th Ordinary Session of IUGS-IGC Council, the IUGS booth exhibition, the Bureau Meeting, the 75th IUGS EC Meeting, the IUGS Awarding Ceremony, the IUGS reception, the IUGS Affiliated Organizations Meeting etc.

Major work of the Secretariat in 2019 also includes: designing and printing the hardcopies of the 2018 IUGS Annual Report and mailing to the IUGS Constituent Groups; mailing the hardcopies of Episodes to the IUGS Constituent Groups; updating the IUGS Contact Database and strengthening links with IUGS bodies; assisting in IUGS membership maintenance; distributing E-Bulletins monthly to over 14,000 recipients; producing IUGS promotional items, including T-shirts, Polo shirts, mouse pads, keychains, hats etc.

Under the leadership of the Secretariat Director Mr. Ma Yongzheng, all the Secretariat staff members will continue full devotion to the Secretariat duties with concerted efforts to actively support the work of the IUGS Bureau and Executive Committee and the broad-ranging scientific activities of IUGS.



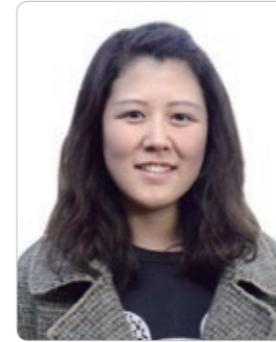
Ms. LI Wei
Secretary



Ms. SITU Yu
Secretary



Ms. GU Yanfei
Secretary



Ms. XU Yaqi
Secretary



Ms. MU Langfeng
Secretary



Mr. YANG Chen
IT Specialist



IUGS Booth at the 2019 GSA Annual Meeting

2019 HIGHLIGHTS

JANUARY 2019

The Deep-time Digital Earth (DDE) Program approved by IUGS EC as the 1st IUGS "Recognized Big Science Program". The DDE Program is a new initiative proposed by several Adhering National Members and International Associations that are Affiliated Members of IUGS. The DDE aims to establish linked Earth Science big-data hubs that are interoperable with other databases including published data in the public

domain and unpublished data in institutions and centres of expertise.

FEBRUARY 2019

The Heritage Stones Sub-commission has started a new Book Series on stones and heritage: Natural Stone and World Heritage. The first volume, just published, is devoted to Salamanca, in Spain. This Book Series is the first to emphasize the importance and significance of natural stone in the construction of a city or a



site recognized as a World Heritage Site by UNESCO, describing the buildings, the stones and the stone quarries.

The 73rd IUGS EC Meeting was held in conjunction with the Deep-time Digital Earth (DDE) forum in Beijing, China. The more than 60 participants included the members of the Executive Committee, the staff of the Secretariat, representatives of all Committees, Commissions, Task Groups, Initiatives, and Joint Programs, and representatives of the 36th IGC,

the 37th IGC, and several Affiliated Organizations and Adhering Countries. All representatives reported in detail their major work in 2018 and in-depth exchanges were conducted on the on-going IUGS scientific activities. The 73rd IUGS Executive Committee Meeting was co-sponsored by the China Geological Survey and the National Natural Science Foundation of China.

The Deep-time Digital Earth (DDE): the first IUGS-recognized big science program officially

launched at the 73rd IUGS EC Meeting and DDE Forum held in Beijing. The events brought together 254 delegates from 24 countries and regions. The meeting delegates were from a number of international organizations, including ISC, UNESCO, IGU, INQUA, IUGG, ISPRS as well as IUGS scientific bodies and Affiliated Organizations, geological surveys, prestigious academic institutions and universities of various countries.

The Heritage Stones Subcommission has



on-line. The textbook covers all that an able sixteen year old student should know and understand about Earth science on leaving school.

This year's IGCP Council Meeting took place on 18-21 February 2019 at UNESCO Headquarters in Paris, France. The Council reviewed 21 new project proposals and assessed the progress of the 27 ongoing IGCP projects. Of these, nine new projects were approved for 2019. There are

produced a new publication: *Heritage Stones and Geoheritage*, published in the journal *Geoheritage*, Springer, as a Special Issue. This volume is a compilation of articles sourced from contributions to sessions on Heritage Stones that were held in different international conferences. The articles describe stones that are part of heritage sites around the world and other geoheritage issues.

The "Exploring geoscience across the globe" textbook has been published for free

now 31 active IGCP projects.

MARCH 2019

Aiming for hazard reduction, the IUGS Task Group on Geohazards plans a cooperative project with Vietnam. A meeting in Hanoi on cooperative project of geohazards and a preliminary field excursion in the northern Vietnam were held during 14 -16 March 2019.

The GSSP for the base of the Cambrian Wuli-

uan Stage and the Miaolingian Series, ratified by IUGS in June 2018, was published in Episodes in 2019.

APRIL 2019

The IUGS Commission for the Management and Application of Geoscience Information (CGI) has launched a competition on the application of CGI standards for geoscience data delivery. CGI will support the travel costs of successful applicant(s) to present (poster or oral) their research at the 36th International Geological Congress in New Delhi, India in March 2020.

Two International Union of Geological Sciences/International Geoscience Education Organisation (IUGS/IGEO) Field Officers have been appointed and trained alongside four new European Geosciences Union (EGU) Field Officers. Yamina Bourgeoini in Morocco and R. Baskar in India will now be offering workshops in their own countries to train school teachers and geopark volunteers in interactive geoscience teaching strategies.

A DDE Working Group Workshop was held April 15-19, 2019 in Kunshan, China. It was participated in by more than 140 participants including five academicians of Chinese Academy of Sciences. The mission of the 4D initiative is to explore ways to advance our understanding of Earth's complex co-evolving geosphere and biosphere through the collection, analysis, and visualization of large and growing data resources.

The IUGS Publications Committee met on the 7th of April for its annual meeting at the SO hotel in Vienna. Matters related to the Geological Society of London Special Publications, the journal Episodes, the IUGS monthly eBulletin and IUGS Social Media were discussed, advancing on the quality and widespread

diffusion of IUGS news.

The IUGS Heritage Stones Sub-Commission had its sixth European Geosciences Union meeting in Vienna on the 11th of April. 13 oral contributions and 10 posters were presented, following a very active Splinter Meeting on the 10th of April. Attending correspondents had the opportunity to discuss about the Global Heritage Stone Resource initiative, as well as future meetings and publications with Natural Stones as main subject.

MAY 2019

An IUGS-IGCC delegation comprising Prof. Qiuming Cheng, President, IUGS; Prof William Cavazza, Vice President, IUGS; Prof Stanley C. Finney, Secretary General, IUGS; Prof Hiroshi Kitazato, Treasurer, IUGS, and Dr. Greg Botha, Secretary General, 35th IGC visited New Delhi, India during 17-22 May 2019 to assess the progress of preparations for the 36th IGC. The delegation met the Executive Committee and the Local Organizing Committee, 36th IGC and visited the venue of the Congress.

The International Conference on Silk-road Disaster Risk Reduction and Sustainable Development (SiDRR Conference 2019), with the theme of "Towards Safe, Green, and Resilient Silk Road", was successfully held on May 11-12, 2019 in Beijing, China. IUGS President Prof. Qiuming Cheng was invited to give a speech at the Closing Ceremony of the Conference.

The IUGS Task Group on Geohazards (TGG) organized the session entitled "Societal Impacts of Geohazards" at the 2019 International Conference on Silk Roads Disaster Risk Reduction and Sustainable Development (SiDRR). 9 oral presentations and one poster were presented.

The IUGS Bureau met on 18 May 2019 in New

Delhi, India in preparation of a 4-day meeting of the International Geological Congress Committee (IGCC). Planning and scheduling of IUGS activities at the 36th IGC were of primary concern, especially given that the opening of the Congress was only ten months distant.

A meeting has been organized in Torino on May 31st to discuss the TecTask activities. M. Mamatani, R. Carosi and S. Iaccarino attended the meeting whereas the other officers participated by e-mail discussion.

JUNE 2019

An article was published by IUGS-IFG committee members on, 'Solving Crimes with Geology', in Engineering and Technology.

JULY 2019

Aiming to promote and facilitate future cooperation in the field of geohazards and natural disasters, the IUGS Task Group on Geohazards (TGG) signed the MoU between the General Department of Geology and Minerals of Viet Nam (DGDMV) under the Ministry of Mineral Resources and Environment (MONRE) and TGG.

A group of 42 early-career scientists and practitioners from geoscience and social science backgrounds set out to tackle at the inaugural Researching Social Theories, Resources, and Environment (ReSToRE) International Summer School. iCRAG – the Irish Centre for Research in Applied Geosciences, IUGS and Geological Survey Ireland were the organising sponsors of ReSToRE, which was run under the patronage of UNESCO.

The International Union of Geodesy and Geophysics (IUGG) celebrated its 100th anniversary at UNESCO headquarters on 29

July 2019. President Prof. Cheng Qiuming was invited to attend the ceremony on behalf of IUGS and received a commemorative plaque presented by IUGG President Prof. Kathryn Waler in recognition of IUGS' long term cooperation with IUGG over the past years.

IUGS President Prof. Cheng Qiuming was appointed by Prof. Daya Reddy, President of the International Science Council (ISC), as Member of ISC's Committee for Science Planning. The terms of service will be three years starting on 1st July 2019.

The ICS' STRATI congress was held in Milano, Italy in July 2019. It was attended by 300 participants and was heralded a major success. The ICS chair was a member of scientific committee.

AUGUST 2019

Seven new heritage stones have been designated as GHSRs by the IUGS EC: Alpedrete Granite (Spain), Bath Stone (UK), Macael Marble (Spain), Makrana Marble (India), Pietra Serena (Italy), Rosa Beta Granite (Italy), and Tennessee "Marble". With this last set, twenty two stones from all over the world have been recognized so far, promoting geology, stones and World Heritage in the scientific community.

The Asia Oceania Geosciences Society (AOGS 2019) met in Singapore during 28 July – 2 Aug 2019. The IUGS Task Group on Geohazards (TGG) organized the session entitled "Global and Societal Impacts of Geohazards" at AOGS. Three presentations and one poster were presented.

IUGS President Prof. Qiuming Cheng was invited to deliver a keynote speech at the Opening Session of the 20th Annual Conference of the International Association for Mathematical Geosciences (IAMG) held in State College,



Pennsylvania, USA on August 10-16, 2019, introducing the new IUGS-recognized big science program - Deep-time Digital Earth (DDE) and encouraging IUGS association members to support and participate in this new programme.

SEPTEMBER, 2019

The new cover of *Episodes* has been applied from the September 2019 issue and will be fixed for the subsequent issues. By fixing the cover, the editorial team can focus more on publishing high quality articles in this prestigious journal.

The Heritage Stones Subcommission has published a new Special Issue on Natural Stones and Architectural Heritage in the journal *Sustainability*. This special issue contains scientific articles on the stones and the heritage built on stone of many different places around the world: Montenegro, Portugal, Italy, Spain, Serbia, Korea, French West Indies, and Greece.

The proposal of the Global Stratotype Section and Point (GSSP) for the base of the Priabonian Stage (Paleocene Series) was approved by a super-majority of the ISPS voting members (89%). The GSSP is identified by the base of a prominent crystal tuff layer, the Tiziano bed, at meter 63.57 of the Alano section (Italy). The proposal will be forwarded to ICS in September for voting.

IFG has submitted to the Geological Society of London (GSL), the draft for 'A Guide to Forensic Geology', which will now commence with publication. This has taken over 10 years to write and the search section has evolved over the past 25 years.

Members of IUGS-IFG continue to provide forensic geology advice and consultancy to police and law enforcement worldwide. This

includes crime scene examination, the collection and analysis of soils and other geological or geological derived materials and searches for burials or concealed items.

IUGS-IFG submitted to the Geological Society of London (GSL), the draft manuscript for, 'Forensic Soil Science and Geology'. This is a Geological Society of London Special Publication, which provides information and support to help police and law enforcement with criminal investigations.

OCTOBER, 2019

IUGS-IFG endorsed and supported the 4th Iberoamerican Seminar on Forensic Geosciences, in Puerto Vallarta, Mexico, 28 October to 1 November 2019, in association with the 'Reunion Anual de la Unión Geofisica Mexicana, (RAUGM)'. IUGS-IFG proposed a key-note presentation, series of knowledge transfer lectures and training in geophysics for ground searches and geological trace evidence.

During the week of 14th to 17th October 2019, the Steering Committee of the first IUGS "Big Science Program" Deep-time Digital Earth (DDE) gathered for their first annual meeting in Beijing. The meeting aimed to prepare the launching of the DDE at 36th IGC in Delhi, the IGC symposia relevant to DDE, a Town Hall meeting, the finalization of the draft of statutes and bylaws, and design of the website and brochures in cooperation with a professional designer.

Following a commitment by Sub-commission chairs at STRATI 2019, in the wonderful and historic setting of the Università degli Studi di Milano, to support the core priority of the International Commission on Stratigraphy to complete all Global Stratotype Sections and

Points for the geological timescale as soon as possible, three stratotypes are being, and will be, discussed by the Commission. The Chibanian (Pleistocene) and the Hauterivian (Cretaceous) are currently under discussion by the ICS and the Priabonian (Paleogene) will be presented soon. A few others are near completion and might be ratified before the start of IGC 36 in India next March.

CGGB initiated the compilation of two IUGS Standard Geochemical Methods manuals in 2019: Manual of Standard Methods for Establishing the Global Geochemical Reference Network; and Black Soil Project Manual of Standard Geochemical Methods. The work on the first manual is in progress and the editors of the second manual are carrying out a final review before submission to external reviewers for comments.

The IUGS Bureau met on 20-21 October 2019 in Saint Petersburg, Russia at the invitation of Dr. Oleg Petrov, Director of the A. P. Karpinsky Russian Geological Research Institute (VSEGEI).

The 14th Workshop of the ILP TF VI on Sedimentary Basins "Understanding the multi-scale formation and evolution of orogens and sedimentary basins" took place with great success 15-19 October 2019, Heviz, Hungary, dedicated to the memory of Frank Horvath with 120 international participants (<https://ilp19.webnode.hu>).

NOVEMBER, 2019

IUGS President Prof. Qiuming Cheng was invited to deliver a keynote speech at the Research Initiative "Eurasian Marginal Seas – Past and Future" (EMS) Expert Meeting held in

Guangzhou, China on 28th November 2019, introducing the new IUGS-recognized Big Science Program Deep-time Digital Earth (DDE).

On the 15th and 16th of November 2019, the IUGS-CGGB has undergone an Ad-hoc review by a four member committee. The two-day meeting was held in Athens (Hellas) and in the premises of the Mediterranean Information Office for Environment, Culture and Sustainable Development.

The ICS chair, Prof. Dr. David Harper, was one of the opening speakers at a congress in Beijing to celebrate the 90th anniversary of the Palaeontological Society of China and first meeting of Asian Palaeontological Association. His remarks were recorded in the Chinese press.

DECEMBER, 2019

The IUGS website has been renewed. The new pages were created by the IUGS webmaster, Giuseppe Di Capua, through an online platform and were published on 12 December 2019. The old menu was re-arranged and new menu items were added in order to show activities and initiatives of the IUGS more clearly.

The 2019 version of ICS Chronostratigraphic Chart, which includes revised numerical ages, was posted on the ICS website (there were about 4 versions of the chart in 2019) and a number of new translations.

The GSSPs for the base of the Hauterivian, the Chibanian and Priabonian stages are currently being evaluated. The former two have been approved by ICS at the time of writing, and are awaiting ratification by IUGS.

IUGS BODIES THE REAL LIFE OF THE UNION

The International Union of Geological Sciences promotes and encourages the study of geological problems, especially those of world-wide significance throughout the activities of IUGS Commissions, Task Groups and Initiatives.

At present IUGS gives special consideration to:

- International standards;
- Geoscience education;
- Geoscience information;
- Environmental management.

IUGS believes that it is of mutual benefit to establish close links with other organizations engaged in geosciences activities and especially those organizations whose work relates to some of the major activities of IUGS.

The list of currently active IUGS bodies testifies to these major aims of the Union. Links allowing description of the organization and activities of the IUGS bodies are provided on the IUGS website (www.iugs.org):

Scientific Commissions

- Commission on Geoscience Education, Training & Technology Transfer (COGE)
- International Commission on Stratigraphy (ICS)
- International Commission on History of Geological Sciences (INHIGEO)
- Commission for the Management and Application of Geoscience Information (CGI)
- Commission on Tectonics and Structural Geology (TECTASK)
- International Commission on GeoHeritage (ICG)
- Commission on Global Geochemical Baselines (CGGB)

Joint Programs

- International Geoscience Programme (IGCP)
- International Geological Congress (IGC)
- International Lithosphere Program (ILP)

Task Groups

- Task Group on Global Geoscience Professionalism (TGGGP)
- Task Group on Geohazards (TGG)
- Task Group on Isotope Geology and Geochronology (TGIG)

Initiatives

- Resourcing Future Generations (RFG)
- Initiative on Forensic Geology (IFG)

Dolores PEREIRA



IUGS PUBLICATIONS AND SOCIAL MEDIA COMMITTEE

Membership of the Publications Committee during 2019:

The Publications Committee consists of:

- Chair – Prof Dolores Pereira
- Prof. Stanley C Finney – IUGS Secretary General
- Mr Giuseppe di Capua – Webmaster
- Dr Gurmeet Kaur – member responsible for social media
- Prof. Jin-Yong Lee – Editor of Episodes

Managing editor of Episodes is Dr Heejung Kim.
E-Bulletin responsible: Dr Silvia Peppoloni

- The chair of the PC procures news monthly

from different IUGS bodies and IGCP leaders to include in both eBulletin and Social Media. Also, she reminds the IGCP leaders of the obligation of preparing a final report the last year of the IGCP to be published in Episodes. She has a continuous contact with them, advising on how to promote their projects.

The chair of the PC is in continuous contact with the Episodes editor and manager to secure complete, punctual and quality issues of the journal quarterly. She also deals with permits to publish Episodes contents (e.g. figures) in other publications, and also to store some articles in the archives of institutions of authors. This activ-



Publications Committee (PC) members from left to right: Jin Yong Lee (Editor, Episodes); Stanley Finney (SG, IUGS); Dolores Pereira (Chair, PC); Heejung Kim (Managing Editor, Episodes); Gurmeet Kaur (Social media manager, IUGS and member, PC); Giuseppe Di Capua (Webmaster, IUGS and member, PC).

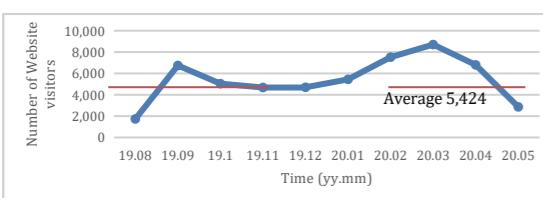
ity secures more dissemination of Episodes publications.

In 2019, the Committee finished preparing and editing statements of policy and ethics for publications. These statements are now uploaded in Episodes web page.

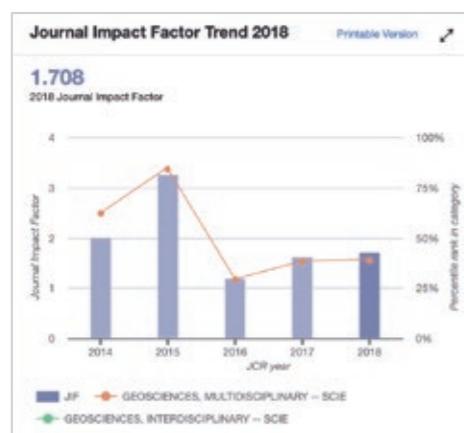
Episodes (by Jin Yong Lee)

108 manuscripts were submitted in 2019, and a total of 33 manuscripts (23 original articles, 7 reports, 1 book reviews, 1 Note from PC Executive and 1 profile) were published with approval for 36 manuscripts through the EM system (Editorial Managing System, <http://www.episodes.org/main.html>), which was established in 2018

During the year 2018, Episodes's website accessed average 28,000. Since the reorganization of the homepage in August 2019, there have been more than 54,000 homepage visitors



Monthly number of website visitors.



Episodes Impact Factor has started to increase once more



Statistics of visitors to Episodes homepage with country (2019.8~2020.5).

for 9 months (Fig. 1). The average number of visitors per day during this period for 9 months is about 5,424. According to the results of Episode website visitor by country, the ranking of the United States and India was the highest, followed by China, South Korea, and Japan.

IUGS social media. (by Gurmeet Kaur)

IUGS Social media is handled by Gurmeet Kaur. Gurmeet deals with the powerful platforms such as facebook, twitter and linkedin. The IUGS social media platforms keep on reporting the relevant information and activities of the various IUGS commissions, Subcommissions, joint programs, task groups and initiatives. The exhaustive IUGS E-bulletin and IUGS website are also promoted through social media for its followers with direct web links provided to open the E-bulletin and website for detailed reports. The IUGS publication Episodes and the research articles published therein are also promoted through social media which are accessible to all free of cost. The year 2019 saw a surge of posts pertaining to 36th IGC. The reporting on IUGS social media is aided with appropriate photographs and web links for further probing. On an average 3-4 posts are done every week and the total facebook followers have crossed a 7.2k mark. The close coordination and cooperation amongst the PC members has been instrumental in the smooth functioning of the IUGS social media platforms.

IUGS website (by Giuseppe Di Capua)

The webmaster's work was focused on the new IUGS website (<https://www.iugs.org>), by finishing its design, creating new menus, pages and homepage, and publishing it in Internet on 12 December 2019. The new IUGS website is produced through the online platform WIX, that allows a user-friendly management, a wide variety of graphic possibilities, remarkable options for configuring the website using many templates. Another important feature of this platform is the low cost for the web-hosting service and a continuous updating of the

functions, performances, and security tools guaranteed by the web-provider. Updating activities of the IUGS website were continuous during the year, regarding all pages. In particular: the sections "News", "Highlights", and "News Archive", in the homepage; "Calendar", to which were added more than 170 geoscience events; "Organization", in order to keep information about IUGS bodies and officers neat; "E-Bulletin", in order to add the new issues released during the year.

More than 33,000 unique visitors accessed the website in 2019 in more than 35,500 visits, with



IUGS - International Union of Geological Sciences

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New IUGS website (<https://www.iugs.org>)

average values of 92 visitors/day, 2 pages/visit, 1:44 minutes/visit.

The E-Bulletin (by Silvia Peppoloni)

The E-Bulletin represents the quickest instrument to disseminate news about IUGS initiatives, activities, achievements, events or publications. During the 2019 it has been regularly

sent to more than 16,000 readers, with the aim to favour the circulation of information within the IUGS community and the possibility of interaction between its members. All IUGS Commissions, Task Groups, Initiatives, IGCP projects and Adhering Bodies are invited to provide a steady flow of material, consisting of concise texts accompanied by few illustrations (photo-



graphs, diagrams, etc). Science reports or papers are excluded.

Geological Society of London. Special Publications

Two books from IUGS activities were published by the Geological Society of London. One book was in production and ten more were at different stages in preparation.

Title and expected publication year*	Type	Proposal received	Accepted	Fee due	Status	Vol	Published
2019							
HP-UHP metamorphism and tectonic evolution of orogenic belts	IGC35	Jul 16	Aug 16	£750	Published	474	May 2019
2020							
Cretaceous Climate Events and Short-Term Sea-Level Change	IUGS	Sep 16	Nov 16	£1250	Published	477	September 2019

Downloading data for the articles published in these books, available at the web page of GSL Special Publications, are very positive. The

chair of the PC is in permanent contact with GSL editorial manager to keep updated and promote IUGS books.

William CAVAZZA



FINANCE COMMITTEE

The FC is an independent body overseeing the financial aspects of the various IUGS activities. As such, the FC reports directly to the Executive Committee and -every four years on the occasion of the International Geological Congresses - to the Joint IUGS-IGC Council. According to the IUGS Statutes and Bylaws (2012) "The Finance Committee ... plan(s) for the finances of the Union, evaluate(s) proposals for the independent auditing of the Union for Council, and advise(s) the Executive Committee on the management of funds and improving the funding of the Union. ... Its primary roles are to identify external financial opportunities for the IUGS and to propose to the Executive Committee ways to improve IUGS financial operations, including (i) the allocation of funds in relation to the strategic priorities and missions adopted by the Executive Committee; and (ii) overseeing the conduct of an independent external audit of IUGS finances..." After a long time of quiescence, the IUGS Finance Committee (FC) was reestablished in 2018. The members of the Committee are: William Cavazza (Chair), Edmund Nickless (formerly Executive

Secretary, Geological Society of London), Jack Hess, (President, Geological Society of America Foundation, formerly GSA Executive Director); Andy Fleet (Chair and Trustee, Dorset County Museum, formerly Assistant Director of Science, Natural History Museum, London).

The main results of the FC activity during 2019 can be summarized as follows:

- quantitative analysis of the current financial situation of the Union;
- identification and analysis of present sources of income and expenses;
- definition of historical trends in the Union's finances;
- evaluation and improvement of financial investments;
- development of a special funding program for the IUGS constituent groups;
- protection and marketing value of IUGS intellectual property;
- alignment of IUGS expenses with strategic priorities;
- increased level of auditing.



Jack Hess



Andy Fleet



Edmund Nickless



INTERNATIONAL COMMISSION ON STRATIGRAPHY



David A.T. Harper
Chair



Brian T. Huber
Vice Chair



Philip L. Gibbard
Secretary General

The work of the International Commission on Stratigraphy continued at pace during 2019 with some notable achievements.

The highlight of the year was undoubtedly STRATI 2019, the 3rd International Congress on Stratigraphy, Milano, Italy, July 2019, sponsored by the ICS. The attraction of Italy, its scientific contributions to stratigraphy, and its varied stratigraphic successions for field excursions generated great interest and attendance, establishing the International Congress on Stratigraphy as the premier, international venue for meetings of stratigraphers. The meeting was attended by 400 participants in the very beautiful Università degli Studi di Milano and was deemed a major success. During the meeting, the Digby McLaren Medal was awarded to Prof. Phil Gibbard (life-long achievements in Quaternary science and stratigraphy) and the ICS Medal to Prof. Shuzhong Shen (for his multidisciplinary research on the Permian System). A lively business meeting was attended by virtually all the subcommission chairs and the executive; challenges and plans for the coming year were discussed and formulated.

During the 2019 cycle, one GSSP was ratified by the IUGS and two accepted and prepared for ratification. The proposal for the base of the Hauterivian (Cretaceous) France was ratified, and the proposals for the base of the Priabonian

(Eocene) Italy and the base of the Chibanian (Pleistocene), Chiba, Japan were accepted by the ICS in 2019 and have since been ratified by the IUGS. In addition, the bases of the Lower/Early, Middle/Mid-, and Upper/Late Pleistocene Subseries/Subepochs at the same GSSPs as the Pleistocene stages (the Chibanian and the previously defined Gelasian Stage GSSP, i.e., base Pleistocene/Quaternary) were accepted by the ICS, together with the marker base of the Upper Pleistocene stage yet to be defined. The last will be presented later this year to the ICS.

The term Precambrian was recognised as informal on the Timescale chart since this name, for the oldest division of Earth history is commonly in use and therefore should not be abolished. The formal nomenclature for the Precambrian Eons/Eonotheems is currently: Hadean, Archean, and Proterozoic. These Eons/Eonotheems correspond in stratigraphical status to the Phanerozoic Eon/Eonotheems. This is part of an ongoing conversation within the ICS. The ICS Chair suggested that interested parties convene to discuss these and further possible divisions of Precambrian, moving towards a rock-based definition of key boundaries. A green paper for discussion within the Precambrian community has been prepared under the leadership of Dr Graham Shields. Following wide consultations,

a formal proposal will be presented to the ICS for discussion.

A new (18th) Subcommission on Timescale Calibration has been established under the leadership of Dr Bradley Cramer. The Subcommission will begin its work in the middle of the year, bringing more rigour to absolute ages associated with the ICS Timescale.

The timescale chart was enhanced by the addition of the new GSSPs, with some five versions published in 2019 and some 20 versions of the chart now available in almost 20 different languages.

During the year, the executive attended a number of key, international meetings. The chair attended the IUGS council meeting in late February and early March in Beijing. This coincided with the spectacular launch of the

Deep Digital Earth (DDE) project, of which the ICS is a founding member. All three members of the executive attended and presented at STRATI 2019 in Milano and Harper was an invited guest at the 90th Anniversary of the Palaeontological Association of China and the first meeting of the Asian Palaeontological Association, during November 2019 in Beijing. The Secretary General attended the 20th INQUA Congress in Dublin in July 2019.

At the Milano and Beijing meetings, Harper presented on the enduring concept of the Golden Spike association with publication in *Acta Geologica Sinica* on the development and history of GSSPs: Harper, D.A.T. 2019. The Golden Spike Still Glitters: The (Re)construction of a Global Chronostratigraphy. *Acta Geologica Sinica* 93 (supplement) (S3): 24-27.



Figure 1: The medal awardees, far left Prof. Shuzhong (ICS Medal), far right Prof. Gibbard (Digby McLaren medal) together with centre left the Chair of the ICS (David Harper) and centre right the Secretary-General of the IUGS (photo David Harper).



Figure 2: Lunch in the courtyard of the Università degli Studi di Milano (photo David Harper).

COMMISSION ON GEOSCIENCE EDUCATION



Figure 3: Delegates enjoy a break in the courtyard of the Università degli Studi di Milano (photo Brian Huber).



Figure 4: Delegates listen attentively to Prof. Gian Luigi Pilla as he explains the intricacies of the Cambrian geology of Sardinia during a post-STRATI field meeting in the sweltering heat (photo David Harper).



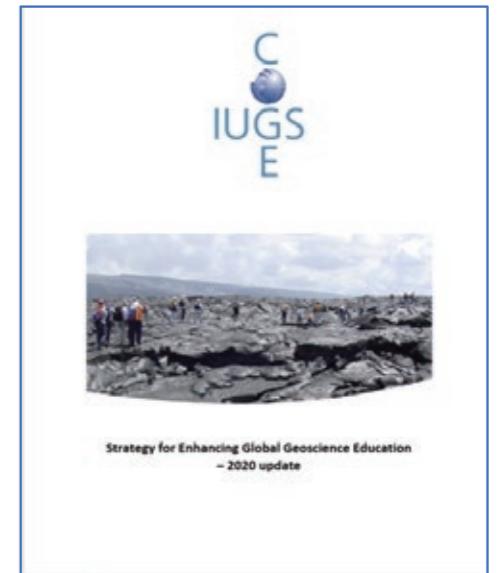
Figure 5: The chair of the ICS addresses delegates during the celebrations of the 90th anniversary of the Palaeontological Society of China and the first meeting of the Asian Palaeontological Association (photo Sylvie Crasquin).

The IUGS Commission on Geoscience Education (IUGS-COGE) published a strategy for enhancing global geoscience education last year in response to a UNESCO/International Geoscience Education Organisation (IGEO) survey into school-level geoscience education worldwide, supported by IUGS-COGE. During 2019 the full results of the UNESCO/IGEO survey were published by UNESCO. The report summarised data covering 51 countries and more than half the world population. It showed that specific support for geoscience education is available in less than half the countries, financial support is not available in most countries and the quality of teaching material is generally of moderate or poor quality across the world. The report concluded that the state of geoscience education shows scope for major improvement. An academic paper based on the data is currently being prepared to disseminate this information more widely. The data has been supplemented by a book published in 2018 with chapters by IGEO members from 27 countries and by the country reports of IUGS-COGE commission members.

On the basis of this information, IUGS-COGE updated its 2019 strategy to the 'Strategy for Enhancing Geoscience Education – 2020 update' document.

Last year's 'Strategy' document and this year's 'Strategy update' document both focus on five main groups of geoscience educators, and progress with each of these groups is focussed on below. The efforts of IUGS-COGE have been affected in 2020 by the coronavirus pandemic, in the ways noted.

1. Teachers of geoscience in schools and



IUGS-COGE 2020 Strategy update document.

colleges with strong geoscience backgrounds

This group comprises several thousands of people worldwide. They are supported by the International Geoscience Education Organisation (IGEO) through the international geoscience education conferences (GeoSciEd) held every four years and the annual International Earth Science Olympiads (IESOs), although the 14th IESO, due to be held in Russia in 2020, was cancelled due to coronavirus. Both these endeavours are supported by IUGS.

This group of teachers is also supported by three-day Geoscience Information for Teachers (GIFT) workshops associated with international conferences. Sadly the GIFT workshop associated with the 2020 International Geological Congress (36IGC) in India, supported by the European Geoscience Union (EGU) was cancelled, whilst the GIFT associated with the



2020 EGU General Assembly in Austria was postponed until 2021, both because of the pandemic.

2.Teachers of science or geography with some geoscience in their teaching, who have weak geoscience backgrounds

There are tens of thousands of these teachers worldwide, which the survey and other evidence indicate are poorly supported in their geoscience teaching. IUGS-COGE is targeting this group in three different ways.

Last year, the IUGS partially supported and fully approved the publication of a free-to-download geoscience textbook aimed at able 16-year old students, their teachers and textbook-writers. This has been followed up this year by a companion volume containing practical teaching activities and questions to consolidate learning, together with an ‘answers for teachers’ book. At the time of writing, these two books were at the final proof-reading stage and are due for publication later in 2020, as free online versions.

The Earthlearningidea website which began in 2008 for the International Year of Planet Earth (IYPE), continues to publish a new Earth science teaching activity every two weeks. 340 activities have been published in English with 1500 translations into 11 other languages. These are currently being downloaded worldwide at more than 40,000 per month with more than 4.5 million downloads so far. A new initiative for coronavirus times has seen the videoing of some of these activities for compilation into workshops for training teachers online. The first month of this initiative saw nearly 7,000 downloads of the videos and more than 100 downloads of the workshop PowerPoints.

Field Officers are being trained by EGU and IUGS, supported by IGEO, to deliver teacher training workshops in their own countries. In



Mobile phone-friendly version of the Earthlearningidea website

2019 the four Field Officers supported by EGU and the two supported by IUGS (Morocco and India) trained 378 teachers, with highly positive feedback, before the pandemic struck. Because the EGU General Assembly GIFT workshop with its associated Field Officer training was postponed this year, it was impossible to train the four new EGU Field Officers and three new IUGS/IGEO Field Officers who had been invited for training (Chile, Malaysia, Togo).

3.Teachers of geoscience in Higher Education

Teachers of geoscience in Higher Education have been surveyed by an EGU pilot survey ($n=106$), showing that 55% have no geoscience-specific support for their teaching, 86% teach beyond their area of geoscience expertise, 95% would be interested in geoscience teaching resources and 72% want to network with other geoscience teachers. EGU is responding by offering grants to Higher Education teachers willing to write up their teaching



Field Officers presenting teacher training workshops.

strategies for free-to-download online publication. Following the cancellation of the focus group meeting planned for the EGU General Assembly, online focus group meetings are being planned to develop and publicise further new initiatives to address the situation. The scope of these initiatives will be broadened worldwide by IUGS-COGE and IGEO support and dissemination.

4.Providers of informal geoscience education

The first workshop to be delivered to informal Geopark educators by a Field Officer was



cancelled due to the pandemic.

5.Researchers into geoscience education

A LinkedIn group for geoscience educators at: <https://www.linkedin.com/groups/12304767/> has been formed and is developing.

All these initiatives are based on a clear strategy founded on globally-collected data and educational research. Their vital importance has been indicated by the poor state of geoscience education worldwide, shown by different survey methods. The support of IUGS for these initiatives is crucial, and will remain so for the foreseeable future.



INTERNATIONAL COMMISSION ON THE HISTORY OF GEOLOGICAL SCIENCES (INHIGEO)

Marianne Klemun, Secretary General



The history of science, on a global scale, has seen a considerable upturn and reached wider audiences than ever before, while the history of geology in particular received huge attention in the wake of the public debate on the Anthropocene. Our commission with about 300 members has faced these challenges in multiple ways, while contributing valuable analyses to the debate. Our members have addressed the many topics of history of geology in different contexts such as lectures, exhibitions, articles, books, collections of documents and digitalisation projects.

One of our main publications this year focussed on the history of oil exploration on an international scale. Figueirôa, S. F., Good, G.A., Peyerl, D. (eds) 2019: History, Exploration & Exploitation of Oil and Gas. Springer.

We extended our cooperation with History of Earth Sciences Society (HESS), many papers are printed within the Journal of the Society: 'Earth Sciences History'.

The highlight of INHIGEO activities each year is our Annual Meeting. In 2019 it took place in Varese/Como in the Lombardy region of Italy. There were 80 registered participants, with 48 oral and 8 poster presentations. The crux of INHIGEO meetings, apart from the lectures, are

our fieldtrips. They are special fieldtrips because they retrace historical events and paths that were important in the understanding of geology. At the meeting in Italy there were three field trips, two one-day trips during the meeting and a 5 day post-meeting one that extended west to Turin. As an example of the diversity of the fieldtrips one of the mid-meeting trips followed in the footsteps of participants of the 7th Extraordinary Meeting of the Italian Society of Natural Sciences held at the Palazzo Estense in Varese in September 1878. Both trips examined geological points of interest in Monte San Giorgio and Valceresio in the Prealps north of Varese. One of the stops on this trip was at La Predèra in Brenno Useria where the Jurassic Pietra Bianca sandstone was extracted from underground galleries for 95 years until 1945. The stone was widely used for buildings, headstones and memorials (including one to those from Brenno who died in the Second World War and fittingly built over the site of the excavations). The stone was exported to as far away as the United States.

As well as examining the geology above ground participants also went underground at several places on the trips. One of these was at Viggiù where in the abandoned workings of Cava Danzi the techniques in extracting Jurassic



At La Predèra in Brenno Useria, the site of an underground mine in the Jurassic Pietra Bianca sandstone. Ezio Vaccari (centre) and Donatella Reggiori (right). (Photo: Mike Johnston)

limestone (principally for use as a building stone) were observed. Prior to the internal combustion engine, the stone was cut using chisels; explosives were never utilised because

of the risk of fracturing the rock and the additional expense. With oil engines the helical wire technique was introduced but quarrying still remained labour intensive.



Jurassic arenaceous limestone at the entrance of the Danzi Quarry. (Photo: Ivan Vtorov)



COMMISSION FOR GEOSCIENCES INFORMATION OF IUGS

Commission for Geoscience Information (CGI) of IUGS has made significant progress and achievements in 2019 in the development and promotion of geoscience information standards and best practice. CGI now has 1 council and 520 members from 78 countries. There was an increase of more than 50 members in 2019, mainly from Asia and Africa. CGI underwent a successful ad hoc review (ARC review) by the IUGS. The review pointed out that CGI has not only stimulated interest in the need for geoinformation standards, but led the development of the GeoSciML and EarthResourceML standards, and standard vocabularies, and that CGI has been extremely successful in meeting its original intent and goals.

1. CGI-IUGS and DDE

As one of the founding members of the IUGS Big Sciences Program Deep-time Digital Earth program (DDE), CGI has been actively and successfully leading the setting up of DDE Standards Task Group (DDE-STG) in 2019 in collaboration with CODATA and DDE. Some 28 geoscientists including 14 CGI member geoscientists and CGI councillors now working in this group. CGI's Geoscience Terminology vocabularies have been adopted by DDE for developing a geoscience knowledge system. CGI's EarthResourceML and CGI/OGC's GeoSciML are also the planned data transfer standards for

DDE.

A fruitful first DDE-STG face-to-face meeting was held in January 2020 in Beijing. Results of the meeting included

- establishing the STG organizational structure
- work mechanisms
- a 10-year research work proposal
- a short-term work plan for 2020
- a DDE knowledge system review
- existing standards implementation
- new data standards demands from DDE
- an activity plan for the 36th IGC in Delhi.

A formal DDE Knowledge Review Procedure is being drafted by the STG and will be provided to DDE in July 2020.

2. CGI-IUGS and YES

CGI and the Young Earth Scientists (YES) Network have cooperated in 2019 to hold a competition on CGI-IUGS Standards for Geoscience Data for young geoinformatics professionals to present an innovative application of CGI standards. The competition winner will present their work at the CGI/IAMG/OneGe-



CGI Council members at the DDE Standard Task Group meeting, Beijing 2020



CGI Council members at the DDE Standard Task Group meeting, Beijing January 2020



COMMISSION ON TECTONICS AND STRUCTURAL GEOLOGY (TECTASK)

RODOLFO CAROSI AND HERMANN LEBIT

ology symposium at the 36th IGC, with travel, accommodation and registration costs met by CGI and YES. Dr. Yaoqin of Jilin University was selected by the CGI Executive Council to be the winner from the 8 applicants.

3. CGI-IUGS and CODATA, IGS

CGI-IUGS is identified as a pioneer by ICS/CODATA on interdisciplinary integration for developing new science (Geoffrey Boulton, 2018). CGI presented on data standards at the CODATA

Beijing 2019 conference. CGI Council members discussed cooperation with CODATA leaders in Beijing in Oct 2019 around geoscience standards. CGI and CODATA co-chairs the joint DDE Standards task group.



4. OGC-CGI Geoscience Working Group

The collaborative OGC-CGI Geoscience Domain Working Group conducted a Borehole Interoperability Experiment in 2019, led by Sylvain Grellet (BRGM, France). The group

evaluated different borehole data models from CGI, OGC, Energistics and EU organisations to address the limitations and similarities in the various models, and documented their work in an OGC Engineering Report (<https://portal.ogc.org/files/19-075r1>).

5. International Use of CGI Standards

IGS (<http://www.igsint.com/>) have created RDF-encoded ontologies from CGI GeoSciML vocabularies in 2019. This innovative work is another example of the wider geoscience community extending the work of the CGI Standards Working Groups.

6. CGI Outreach

Several presentations on CGI standards - GeoSciML and EarthResourceML standards and vocabularies were done in geoinformation meetings such as Geoscience Information Consortium (GIC) Africa in Africa and Asia. The Geoscience Information in Africa (GIRAF) Network workshop at the next Colloquium of African Geology (CAG28) in Fez, Morocco will include a session on CGI work.

The Commission on Tectonics and Structural Geology represents an initiative by Earth Scientists to stimulate communication and coordination within the international science community and to provide information to the public. The group encourages innovative research and continued education in Tectonics and Structural Geology, the growth of intellectual capital and hence the impact of our science on the wealth of the global society. TecTask reaches out to scientists and students, particularly those from developing countries, to share cutting-edge research and development, and state-of-the-art training.

Among the initiatives of the Commission is the establishment of a homogeneous professional terminology.

The Commission has developed a wikipedia-like internet platform (http://www.tectonique.net/ttt/index.php?title>Main_Page) populated with terms and their definition, which can be publicly discussed by the enrolled members before those are elevated into formal glossaries or a dictionary. With the gradual increase of entries it is anticipated that the Structural Geology & Tectonics community will recognize and share the forum and actively participate in the formulation of the terms and definitions.

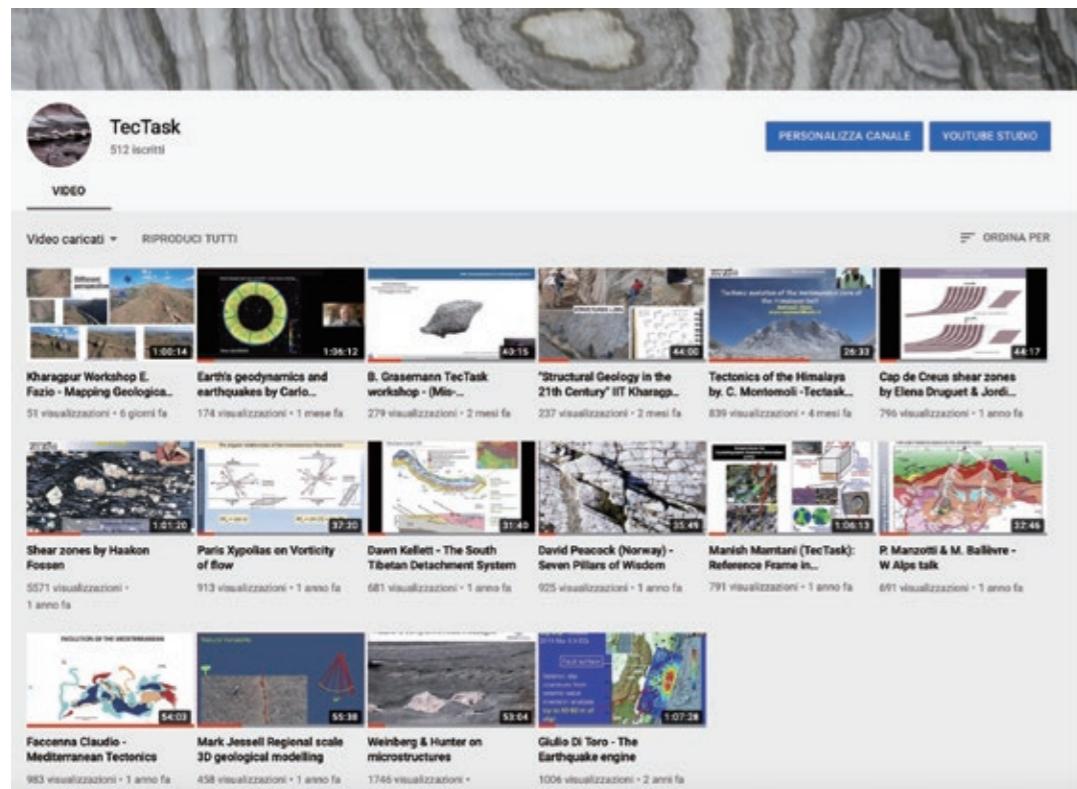
David Peacock, Lorenzo Gemignani and Rodolfo Carosi increased the contents of this page during 2019. Some hundreds of terms have been reviewed with references to international papers and books. The site is not a simple alphabetic list of terms but each term has been defined on the basis of the following groupings using also

recently developed concepts such as the topology of fractures and each term is also classified ss: geological, geometric, topological, kinematic and mechanical

The TecTask You Tube channel (<https://www.youtube.com/channel/U CXFYicccBYX-w85bneuMm4Xgg>) provides monthly invited seminars. Topics of Structural Geology and Tectonics are covered, including regional studies of wide interest. The community has found the seminars useful for both their teaching and their research. There are now 16 videos uploaded in the channel with more than 16,000 views.

Outcropedia, the long-term show piece of the Commission, was overhauled in 2018. The new website (<http://outcropedia.tectask.org/>) is now able to host larger photos of higher quality and allows for quick navigation.

In June 2019 the Deformation Mechanisms, Rheology and Tectonics (DRT-2019) congress, a very important international meeting in Structural Geology & Tectonics, was organized by the former TecTask officer Prof. P. Bons and the current TecTask treasurer and officer Dr. Enrique Gomez-Rivas in Tübingen, Germany, in June 11-14, 2019. This edition celebrated the career of the TecTask founder Prof. Cees Passchier, together with the career of Prof. Janos Urai. In this meeting the Hank Zwart medal has been assigned by the TecTask to Cees Passchier. The Vice-Chair Manish Mamtni gave the medal to CP during the meeting.



Screen shot of the TecTask youtube channel



The "HENK ZWART MEDAL" of the IUGS Commission on Tectonics and Structural Geology (TecTask) was conferred on Professor Cees W. Passchier on 14 June 2019 during the conference dinner of the 22nd Deformation Mechanisms, Rheology and Tectonics (DRT) Conference in Tübingen (Germany). The announcement was made by Professor Janos Urai. On behalf of TecTask, Professor Manish A. Mamtani (Vice-Chair, TecTask) handed over the citation to Professor Cees W. Passchier.

COMMISSION ON GLOBAL GEOCHEMICAL BASELINES

<https://www.globalgeochemicalbaselines.eu/>

The mission of the IUGS Commission on Global Geochemical Baselines (CGGB) is to:

- (i)Develop a Standard Methods Manual for the Global Geochemical Reference Network project;
- (ii)Establish a global Geochemical Reference Network (GRN) similar to a geodetic network for levelling existing databases (prime objective);
- (iii)Prepare a global geochemical database and its representation in map form;
- (iv)Document the concentration and distribution of chemical elements and species in the Earth's near-surface environment.

The database is urgently needed for environmental and natural resource management throughout the world. The CGGB also promotes and facilitates the implementation of harmonised sample collection, preparation, quality control, and analysis protocols for geochemical mapping programmes.

The CGGB, in early 2018, decided on the contents of a comprehensive 'International Union of Geological Sciences Manual of Standard Methods for Establishing the Global Geochemical Reference Network'. Preparation of the first draft of this document was initiated, and continued during the whole of 2019 with collaboration and contribution by many members from throughout the world.

The CGGB is participating in the Global Black Soil Critical Zone Geo-Ecological Survey (BASGES) project, which is coordinated by the

Shenyang Geological Survey of China. The standard methods manual for this project with the title "International Union of Geological Sciences Manual of Standard Geochemical Methods for the Global Black Soil Project" was completed, and approved for publication by the IUGS Executive Committee at its 74th meeting in Busan (South Korea) on the 17th of January 2020.

In 2019, CGGB together with the Society for Environmental Geochemistry and Health and the EuroGeoSurveys Geochemistry Expert Group organised a session on 'Geochemical mapping for environmental and resource management' on the occasion of the 15th International Congress of the Geological Society of Greece. It also organised a one-day workshop on 'Global-scale Geochemical Mapping'.

The CGGB organised a two-day pre-congress workshop on 'Global-Scale Geochemical Baselines and Applied Geochemistry' on the occasion of the 5th Young Earth Scientists Network in Berlin (Germany), 8th and 9th September 2019 (Photo 1). In the plenary session of the 11th of September 2019, Alecos Demetriadis (Treasurer and Chairperson of Sampling Committee) delivered a keynote presentation with the title 'Global Geochemical Mapping for Resource and Environmental Management'.

The joint annual business meeting of the IUGS CGGB and EuroGeoSurveys Geochemistry Expert Group was hosted by the Mining and Geological Survey of Hungary at its premises in Budapest on the 26th and 27th September 2019 (Photo 2).

IUGS SUBCOMMISSION ON SITES AND COLLECTIONS (IUGS INTERNATIONAL COMMISSION FOR GEOHERITAGE)



Photo 1. (a) Alecos Demetriadis (left) and Ariadne Argyraki (right) in front of The FOREGS periodic table of residual topsoil in Europe, and (b) group photograph of Workshop participants and tutors.

The sub-commission on Geoheritage Sites and Collections (International Commission for Geoheritage) has the mission to promote geoheritage for the IUGS, especially in the area of geosite creation, assessment, use and management. It is an important bridge for all the IUGS to insure the societal relevance of fundamental geoscience work.

Duties for the IUGS includes assessment of international scientific significance of UNESCO Global Geopark nominations and providing reviewers for Geological World Heritage sites (Figure 1). The sub-commission works to assure high standards in geoheritage. Geoheritage collections are often important ex-situ

components of geosites and are also covered by the sub-commission.

In 2019 the Sub-commission has:

- Advanced in IUGS Global Geopark Scientific Assessment criteria towards implementation
- Started a project with UNESCO on Sustainable Resources in Geoheritage Areas with Resourcing Future Generations.
- Started a sub-commission sponsored IGCP project: 'Geoheritage for Resilience'.
- Liaised with IUCN Geoheritage Specialist Group including 'Key Geoheritage Areas', and IUCN Geoheritage motions.



The CGGB underwent an ad hoc review on the 15th and 16th of November 2019 in Athens (Hellas) (Photo 3). The members of the Ad hoc Review Committee were Roland Oberhänsli (ARC Chair – IUGS Past President), Kristine Asch (ARC Secretary – IUGS Vice President), Mateja Gosar (member, Geological Survey of

Slovenia), and Stephanos P. Kilias (member, National and Kapodistrian University of Athens). The CGGB was represented by Alecos Demetriadis (Treasurer), Ariadne Argyraki (Public Relations and Finance officer), and Christina Stouraiti (proposed Treasurer for 2020-2024 term).





Activities for UNESCO Global Geoparks

In 2019 the sub-commission set up a Global Geopark Review group to manage the IUGS role in Geoparks. This group is working now on the huge task of reviewing the 21 proposed Aspiring Global Geoparks in 2019. The large increase is accompanied by an increasing diversity of sites, both thematically and geographically.



Figure 2. Sustainable Resource use in Geoheritage areas. Left: Peruvian quarrymen drawing their own version of the geological history of their Sillar rock, an exercise to bring them, geologists, architects, local government, tourism operators together to deal with geological risk with geoheritage. Right: example of the Sillar in an UNESCO World Heritage protected building, constructed on a debris flow (by the dog), who is standing on lava paving stones. Here you see the mix of geo- and cultural heritage, hazards and short circuit resource use. This is also part of Geoheritage for geohazard Resilience UNESCO International Geoheritage Programme project 692.

Sustainable Resource use in Geoheritage (with RFG)

The UNESCO Sections for Latin America and the Caribbean requested IUGS Geoheritage Commission's support for an initiative exploring sustainable resources use in geoheritage areas (Figure 2). The project has started with a survey sent to Latin American geoparks and geoheritage areas, is in operation by October 2019.



EGU2019

The Geoheritage sub-commission supported the Geoheritage and Geodiversity session and splinter meeting at the EGU 2019. 34 presentations were given. The splinter meeting provided an opportunity to discuss with Global Geopark and general geoscience.

The Sub-commission also supported an EGU

booth for the ERASMUS+ 3DTeLC (3D - Teaching Learning and Communicating), which was part also of the recently accepted IGCP692 project 'Geohazards for Resilience'. This was one of the most successful EGU booths of 2019 and has been invited to return for 2020 (Figure 3).



Figure 3. EGU meeting, Vienna 2019. Left: Presentation of Geoheritage sites in 3D virtual Reality was an off shoot of the sub-commissions session and splinter meeting. Right: Intangible Geoheritage that can be touched! Earth models for the blind being tested by young students at the Vienna International school.

International Geosciences Programme project 692 – Geoheritage for Geohazard Resilience

This project was accepted in 2019 and is the first Geoheritage IGCP project dedicated to geosites and natural hazards. The project will set up a global network of geoheritage sites that deal with geoheritage aspects of the resilience to natural hazards (Figure 4).



Figure 4: Geoheritage for Resilience in the hottest place on Earth. Left: The Dallol Geothermal field in the Danakil of Ethiopia, is a object of the sub-commission's IGCP project. Protecting the unique natural features goes hand in hand with protecting the geotourists and the resource use. Right: A volcanic bomb house showing the use of local stone, reflecting hazards near Arequipa, Peru.



IUCN Geoheritage Specialist Group (Key Geoheritage Areas)

The Geoheritage Specialist Group of the IUCN is a member of the World Council for Protected Areas, and is the IUCN counterpart to the IUGS Geoheritage Commission. The Sub-commission participates in this. Importantly, the IUGS Global Geosites is being discussed as a basis for an IUCN-IUGS joint label 'Key Geoheritage Areas' which would identify the major areas of geoheritage significance World Wide and form a basis for their inventorying and eventual inclusion in Geoparks, World Heritage or other protection schemes.



Figure 5: Sites and Collections: Left: Here a youngster is confronted not only with rocks but information extracted from scientific studies presented in an easily understood way (Lemptégy Volcano, Central France). Collections are an area of the sub-commission to develop, and the use of collections for the communication of geoheritage and broader geoscience is a developing theme. Right: Here is a Quarry on Ometepe Island, Nicaragua, youths play baseball, with a graben behind, used as a geosite to explain tectonics and earthquakes to locals and tourists. Sites like this are both local resources for material, recreation as well as education, and need to be valued and managed sustainably.

The IUGS representative has assisted the group preparing motions for the IUCN congress in Marseilles in June 2020. The IUGS weight of geological expertise is called for to increase the profile of geosciences in the IUCN.

Note about collections

IUGS has requested the Geoheritage Commission to look into the creation of a collections sub-commission. During 2019 we consulted those of the sub-commission, who work with collections, museums. Site and Collections go hand in hand in most geoheritage areas (Figure 5).

IUGS SUBCOMMISSION ON HERITAGE STONES (IUGS INTERNATIONAL COMMISSION FOR GEOHERITAGE)

The HSS is a Working Group established in 2011, with the main objectives of: facilitating formal designation of natural stones that have achieved widespread recognition in human culture (i.e. heritage stones); creating the "Global Heritage Stone Resource" (GHSR) as an internationally recognised heritage stone designation; and promoting the adoption and use of heritage stone designation by international and national authorities.

During 2019, the HSS was very productive and carried on several activities, reaching many achievements. Complete information can be found at our web page: www.globalheritage-stones.com

- Seven new stones were recognized and approved as GHSR by the IUGS EC. That made a total of 22 recognized GHSR so far.
- We increased the number of correspondents, involving young researchers (several from low-income countries), up to 121.
- Several research networks have been established as a consequence of the project, and contacts with stakeholders are maintained at the moment, to involve the different sectors in the outcomes of our project.
- Several outreach videos were produced by one of our correspondents in Spain.
- Several special issues were published, giving more than 30 papers, mostly published by HSS correspondents:
 - *Heritage Stones and Geoheritage*,

Geoheritage (Springer), coordinated by Pereira and Cárdenes (Guest Editors). <https://link.springer.com/journal/12371/11/1>

- Salamanca: city of Stone and Heritage: <https://www.libreriaproteo.com/libro/ver/2297022-salamanca-ciudad-de-piedra-y-patrimonio.html>
- Heritage Stone and World Heritage: Salamanca, Spain: <https://www.taylor-francis.com/books/9781351013352>
- Natural Stones and Architecture, Sustainability (2019), coordinated by D. Pereira, L. Catarino and G. Dino. https://www.mdpi.com/journal/sustainability/special_issues/nsah

The HSS organized the sixth international meeting on Heritage Stones at the EGU 2019 in Vienna: 13 oral contributions and 10 posters were presented, following a very active Splinter Meeting on the 10th of April. Attending correspondents had the opportunity to discuss about the Global Heritage Stone Resource initiative, as well as future meetings and publications with Natural Stones as main subject. The meeting was organized in the frame of the IGCP-637 project. At this meeting, one of our young correspondents, Parminder Kaur, was awarded with the Outstanding Student Poster. Parminder was also granted with IGCP-637 funding to participate in EGU 2019, together with some other young researchers that are also HSS correspondents.

INTERNATIONAL GEOSCIENCES AND GEOPARKS PROGRAMME AND IUGS IN 2019



HSS correspondents meet at IUGS booth with UNESCO representatives.



HSS poster session at EGU 2019

UNESCO is the only United Nations organization with a mandate to support research and capacity in Earth Sciences and the International Geoscience and Geoparks Programme is UNESCO's and IUGS's flagship.

The International Geoscience and Geoparks Programme (IGGP) consists of two pillars both delivered in collaboration with the International Union of Geological Sciences (IUGS): International Geoscience Programme (IGCP) and UNESCO Global Geoparks (UGGp).

International Geoscience Programme (IGCP) in 2019:

Since 1972, the International Geoscience Programme (IGCP) has partnered with the International Union of Geological Sciences (IUGS) to bring together thousands of Earth scientists from around the world and allowed them to benefit from the cooperative spirit generated under the umbrella of UNESCO,

The IGCP promotes collaborative projects with a special emphasis on the benefit to society, capacity building, and the advancement and sharing of knowledge between scientists with an emphasis on North-South and South-South cooperation. IGCP operates by providing seed funding grants donated by UNESCO, IUGS and private sector companies.

The Council of the International Geoscience Programme (IGCP) held its 4th Session in February 2019 in Paris and evaluated 49 projects including 21 new proposals. The 2019 IGCP Council also adopted a new vision and annual special topics for prioritization in the IGCP 2019 call for project proposal.

In 2019, nine new projects were approved and 31 projects were active, 26 projects receiving financial support from UNESCO, IUGS, Republic of Korea and China National Commission to UNESCO.

In 2019, 203 IGCP Project Leaders from 57 different countries organized 39 IGCP project meetings in 27 countries with the participation of over 4,400 scientists from 110 countries, these meetings were financially supported by the IGCP Programme funds in collaboration with UNESCO Secretariat and IUGS treasurer (Figures 1 and 2). IGCP field trip exchange project, initiated in 2019, supported 32 early career scientists from 21 countries to participate five short courses and IGCP field trips organized in Ireland, Ivory Coast, Tunisia, China and Nepal (Figure 3).

As of October 2019, the IGCP UNESCO secretariat received 26 new IGCP project proposals, which is a substantial increase from previous years. We believe that this considerable increase in IGCP project proposals is due to the extensive outreach and communication activities led by the IGCP Secretariat and IUGS as well as new definition of IGCP vision, which is addressing societal challenges.

In 2019 UNESCO HQ contributed, \$125,250.00 for IGCP 2019 Projects and \$16,770.00 for IGCP Council meeting related logistics, adding up total UNESCO contribution to the IGCP in 2019 total amount of \$142,020.00. IUGS kindly provided \$ 60,000.00 and total IGCP budget for projects and Council meeting was \$202,020.00, this is a substantial increase from previous years thanks to continued support of the IUGS and new private sector donations.

	IGCP PROJECTS	IGCP MENTORSHIP AND EXCHANGE INITIATIVE
2019 Budget	\$ 185k	\$37k
Number of participants received funding from UNESCO and IUGS	226	32
Number of IGCP events received funding from UNESCO	39	5
Total number of IGCP events organised in 2019	70	5
Total Number of total participants the IGCP project events	4417	175

Figure 1: IGCP projects and IGCP Secretariat led capability activities outreach and funding distribution showing that IGCP financially supported 258 geoscientists in 2019 with total \$222k.

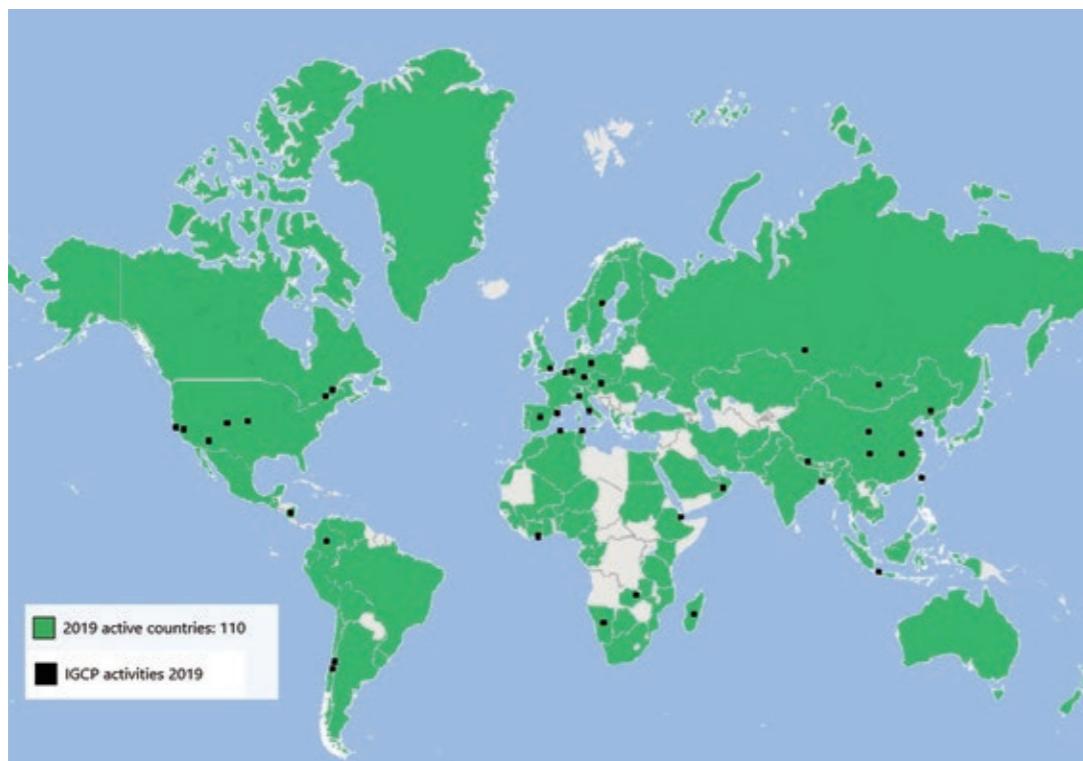


Figure 2: World map showing 31 IGCP 2019 projects participating member states (in green) and different locations of the IGCP projects activities of 2019 (in black)



Figure 3: IGCP 672 Himalayan glaciers: assessing risks to local communities from debris cover and lake changes using new satellite data project Workshop and field training on Ponkar Glacier: 3-17 November 2019.

UNESCO Global Geoparks programme in 2019:

UNESCO Global Geoparks (UGGp) are laboratories for sustainable development, which promote the recognition and management of Earth heritage, and the sustainability of local communities. As of December 2019, there are 147 UNESCO Global Geoparks within 41 Member States. The international significance of the geological heritage of each new UNESCO Global Geopark application is being assessed by IUGS nominated desk-top advisors following specific and publicly available scientific criteria. IUGS coordinates this role to ensure that all statements on the scientific value and international significance of the geological heritage of an aspiring UNESCO Global Geopark are available annually in time so that evaluators can access them ahead of

the field evaluation mission. In 2019, IUGS experts assessed 14 new UNESCO Global geoparks applications. IUGS is also non-voting member of the UNESCO Global Geoparks Council and IUGS representative participated to the 4th session of UGGP Council in Lombok island of Indonesia.

During 2019, UNESCO's collaboration with the IUGS- brought positive, international exposure at the highest level in geology. The work conducted by IGCP and UGGP has been multi-disciplinary from geoscience research, education and outreach to sustainable development of local communities, resulted in increased visibility of geosciences across international borders and improving wellbeing of global citizens.



INTERNATIONAL LITHOSPHERE PROGRAM (ILP)



International Lithosphere Program (ILP) celebrates its 40 years anniversary in 2020. Realising that the lithosphere is the connection between deep Earth and the surface, ILP was formed in 1980 by International Union of Scientific Unions (ICSU - today ISC) to:

- promote interdisciplinary research on the lithosphere
- at the interface between IUGS and IUGG
- through multidisciplinary research projects.

ILP's activities build on the understanding that major breakthroughs in the study of the Lithosphere require integration of imaging and monitoring, reconstruction and process modelling. ILP seeks to achieve a fine balance between "addressing societal needs", e.g. understanding natural catastrophes and other solid earth processes that affect the biosphere, providing information for improved resource exploration and environmental protection; and "satisfying scientific curiosity" to promote high-level fundamental research.

Background for the initiation of ILP was the recent acceptance of plate tectonics and experience from the successful International Geophysical Year 1957-59, International Upper Mantle project 1964-70 and International Geodynamic Project 1972-79 which, together, demonstrated the need for a sustainable interdisciplinary geoscience programme. ILP is financed through national contributions from member countries and annual contributions from IUGS and IUGG, and GFZ-Potsdam complimentary runs the

secretariat.

ILP is a bottom-up organisation that takes initiatives to bring together individuals and organisations in Task Forces and Regional Committees, selected solely on the basis of scientific quality and societal needs. A key feature is their dynamic nature and focus on bringing in new talent. Task forces exist for a limited period of five years, which may be extended for one term after successful review. The task forces are organised in four thematic subjects:

- Geoscience of Global Change
- Contemporary Dynamics and Deep Processes
- Continental Lithosphere
- Oceanic Lithosphere
- Some major successful initiatives, many of which still continue at high level outside ILP, from the first 40 years with ILP include:
 - Global Seismic Hazard Map
 - World Stress Map
 - Global Strain Rate Map
 - Global Impact Studies
 - International Continental Drilling Program (ICDP)
 - Global Geoscience Transects and programmes, such as EGT, EUROPROBE, TOPOEUROPE, TOPOASIA
 - The Regional Geoscience Transects programme.

Activities in 2019 include:

- 7 regular meetings and workshops open to all interested scientists
- the annual business meeting held during the EGU meeting in Vienna with presentations of

projects and awards, open to all interested scientists.

- some 20 symposia at scientific conferences
- special issues of scientific journals (5-10 per year)
- ILP awarded the Evgeni Burov medal to Dr. Luc Lavier and the Flinn-Hart Award to Dr. Alexander Koptev

- active support to the Resources for Future Generations (RFG) conference in Vancouver, the Deep Earth Exploration and Practices (DEEP) in Beijing, and the initiation of the deep-Time Digital Earth (DDE) programme of IUGS.

Two new task forces were approved in 2019 on:

- Lithosphere Structure, Mineral Resources
- Lithospheric Seismicity and Tectonics in the Himalaya

and eight task forces will terminate by the end of 2020. Following a call in 2019, ILP has recently approved ten new dedicated programmes for the period of 2021-2025:

- Global Lithospheric Stress - The World Stress Map in 3D
- Continental Lithosphere: a Broadscale Investi-

gation (CoLiBrI)

- LithoMar - Assessing the Relationships Between Lithospheric Processes and Seafloor Topography at Oceanic Hotspots and Divergent Margins

- Deformation and Magmatic Processes from the Lithosphere to the Surface: Integrated Multidisciplinary Approaches

- Sedimentary Basins

- Global Geo Transects (GGT)

- Bio-Geodynamics of the Lithosphere

- Anatolian Tectonics (ANATEC)

- EUROPE: 4D Topography Evolution in Europe: Uplift, Subsidence and Sea Level Rise

- Lithosphere of East Antarctica

This broad coverage of lithosphere research includes researchers from all continents, and we are pleased that the group of PIs include an increasing number of early career scientists.

ILP is now 40 years old, but it is as vivid and active as ever!

Hans Thybo, President, June 2020, web-site:
<https://www.scl-ilp.org/>



Participants at the 14th workshop of the Task Force on Sedimentary Basins, held in October 2019 at Lake Balaton, Hungary. This conference was dedicated to the memory of Frank Horváth. Photo by Eszter Mészáros.



The Evgeni Burov Medal for pioneering contributions by a mid-career scientist was awarded in 2019 to Dr. Luc Lavier for his great contribution to lithospheric dynamics in an open and collaborative spirit (left, courtesy K. Asch). The Flinn-Hart Award to an outstanding young scientist was awarded in 2019 to Dr. Alexander Koptev for his insightful and fundamental contributions on the thermal and mechanical interactions in the lithosphere (right, photo by A. Rudloff).



INITIATIVE ON FORENSIC GEOLOGY (IFG)

In 2019, IUGS-IFG held at least 62 formal events. Training was provided with the Brazilian Federal Police on forensic geology and microscopy, held at the Brazilian National Police Academy. IUGS-IFG contributed to a three-day European training event with the European Network of Forensic Science Institutes (ENFSI), European Meeting on Forensic Archaeology (EMFA). Practical training was provided for a multi-disciplinary team investigating a simulated major incident involving human remains. It was attended by police officers from England, Scotland, Sweden, Germany and the Netherlands. IUGS-IFG arranged a meeting with the FBI Laboratory, at FBI headquarters in Washington DC, USA, to discuss developing a search strategy for burials. IUGS-IFG also supported the FBI geologists for the production of a training video on soil collection at crime scenes, aimed at field agents. The 4th Iberoamerican Seminar on Forensic Geosciences was held in Puerto Vallarta, Mexico, in association with the Reunion Anual de la Unión Geofisica Mexicana, (RAUGM). IUGS-IFG also co-organised the previous Iberoamerican seminars in; Colombia, Brazil and Argentina. Training was provided on ground search techniques, crime scene examination and the recovery and analysis of geological trace evidence from a car. The UK Parliament, House of Lords, Inquiry into Forensic Science issued a report. IUGS-IFG submitted evidence for this inquiry and the IUGS-IFG

Forensic Science Adviser served as the Specialist Adviser to the Committee. The manuscripts for; 'A Guide to Forensic Geology' and 'Forensic Soil Science and Geology', were submitted to the Geological Society of London and IUGS, with both publications expected in 2020-2021. IUGS-IFG Chair attended meetings in China, Chile, Democratic Republic of the Congo (DRC), Finland, Zambia and South Africa to consider geological methods to manage and mitigate fraud and corruption in the mining and minerals industry. Presentations were delivered to schoolchildren and students. Interviews were given to the media and journalist (including the BBC in the UK, and CBC in Canada) to assist with the promotion and public understanding of how forensic geology can be applied to the police and law enforcement. IUGS-IFG provided advice for searches aimed at locating mass graves in Lithuania and Poland. These were believed to be related to the Holocaust in Second World War. IUGS-IFG also supported University of Warsaw to establish a new course of forensic geology and visited the Forensic Police Laboratory in Poland. IUGS-IFG agreed to support a two years project in Colombia, at the Universidad Antonio of Nariño, regarding the search for mass graves. Forensic Geology became established in India, following meetings held in Delhi with the Government of India Ministry of Home Affairs, Forensic Laboratories and National Institute of Criminology and Forensic Science.



Several members of the IUGS-IFG maintained their listing with the UK National Crime Agency as 'Expert Advisers' in forensic geology and

IUGS-IFG continued to provide forensic geology advice and support to police and law enforcement worldwide.

Encs. Selected Photographs



Forensic recovery of a shallow grave including; (A) the sieving of soil, (B) removal of grave contents, (C) systematic geophysical survey of grave base, (D) identification of human remains by a forensic anthropologist, (E) examination of the grave base and side walls, and (F) the investigation of tool markings, probably by a spade, on the grave floor and walls. European training on search and the excavation and recovery of graves. Organised by UCLAN in association with ENFSI, EMFA and supported by IUGS-IFG (Photos: Laurence Donnelly, In Donnelly 2019, IUGS-IFG Annual Report for 2019).



IUGS-IFG supporting the IUGS-IFG FBI Adviser during the filming for a training video on soil selection from crime scenes. The video was filmed at the University of Kentucky College of Agriculture Food and Environment, in association with Dr Brad Lee, Suzette Walling (Extension Associate, holding the sun filter) and Brian Volland (videographer, behind the camera), IUGS-IFG FBI Adviser (Jodi Webb, being filmed) (Photos: Jodi Webb and Brad Lee, In Donnelly 2019, IUGS-IFG Annual Report for 2019).



CGMW-GEOLOGICAL MAP OF THE FUTURE-THE 1:5 M WORLD AND THE DIGITAL INFORMATION THEREIN

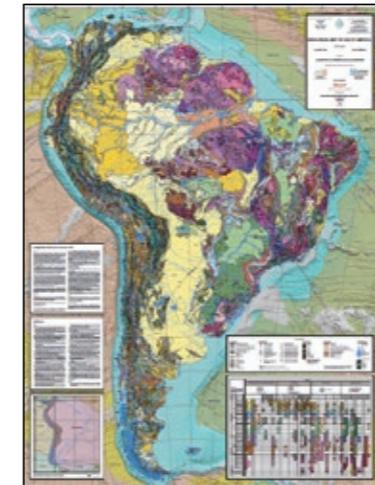
The Commission for the Geological Map of the World (CGMW), as one of the oldest affiliated organization of the IUGS, carries on its duty in promoting and coordinating the preparation and publication of small scale solid earth science maps of continents, oceans, major regions of the earth. Beyond the emblematic Geological Map of the World at 1:35 M and its GIS, CGMW has completed by the year 2020 several top mapping projects, including the Geological Map of South America at 1:5 M which was launched by the end of 2019 and which is a wonderful example of cooperation between the countries of South America. Although CGMW emanated originally from the national Geological Surveys, which are still the main active contributors, associate members such as universities, geological societies and members from the industry now share many of the projects. The new Structural Map of the Caribbean at 1:5 M, now in press, is an example of such joint-cooperation that allowed for production of a new type of map, which combines geology and reprocessed geophysical data.

CGMW is spearheading the world of geosciences by fostering international cooperation between countries and by providing a forum for discussions. A first step in research associated with mapping is through IGCP projects with the objective of consolidating the cooperation with UNESCO and to reach out for the communities

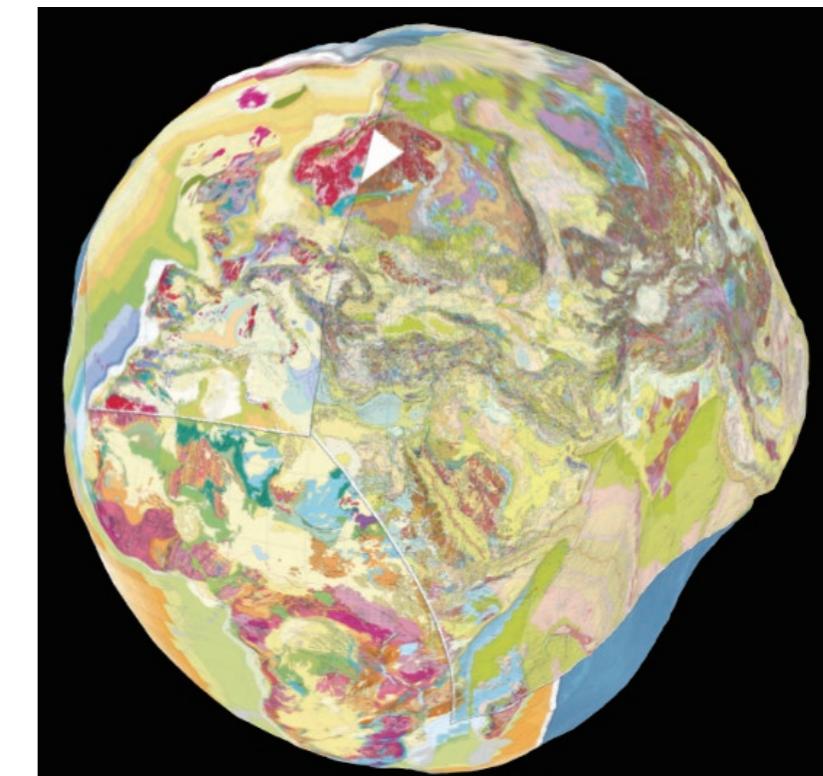
of young scientists of emerging countries in the World. CGMW is the leader of the IGCP667, which is producing the first Map of the Orogens of the World and is also a think-tank for the concept of orogens. In preparation for the 36th IGC in New Delhi, CGMW had put considerable effort into creating a new version of the Structural Map of the Indian Ocean 1:40 M and the map of the Eastern Pacific. These complete the all-digital set of maps of the World Ocean. The 36th IGC also provides the opportunity for gathering of experts on the geology of the Indian Ocean and to publish a CGMW booklet on the “Indian Ocean and its margins”.

CGMW is now engaged in one of the largest mapping projects ever. In cooperation with the IUGS Deep time Digital Earth (DDE) project, it will create the Geological Map of the World at scale 1:5 M. This map will come with a large database supported with AI technology, which will allow the community to remotely and readily access the geological information underlying the map.

After the success of the CGMW 3D Geological Globe, which is on the desk of many geoscientists, the use of the VtWeb visualization tool (<https://visioterra.org/VtWeb>) demonstrates quick and friendly access to the map. This is the vision of CGMW in collaboration with IUGS, IUGG, and UNESCO for the future.



The Geological Map of South America at 1:5 M and the launch in Bogota, Colombia (November 26th & 27th, 2019)



Some existing CGMW maps at 1:5 M for the world compilation. VtWeb visualization tool (<https://visioterra.org/VtWeb>)

LIST OF IUGS EXECUTIVE COMMITTEE (1961-PRESENT)

1961-1964

President: J. M. Harrison (Canada)
Past President: A. Noe-Nygaard (Denmark)
Secretary General: T. Sorgenfrei (Denmark)
Treasurer: J.A. Dons (Norway)
Vice President: J. Lombard (France), B.C. Roy (India), T. Kobayashi (Japan), L. Hawkes (U.K.), I. Gorsky (U.S.S.R.)
Chairman of the Constitutive Assembly: Noe-Nygaard (Denmark)

1964-1968

President T.F.W. Barth (Norway)
Past President J.M. Harrison (Canada)
Secretary General: W.P. van Leckwijck (Belgium)
Treasurer: R. Trümpy (Switzerland)
Vice President: F. Gonzalez-Bonorino (Argentina), V. Zoubek (Czechoslovakia), B.C. Roy (India), R. W. Willett (New Zealand), T. B.Nolan (U.S.A.), I. Gorsky (U.S.S.R.)

1968-1972

President: K.C. Dunham (U.K.)
Past President: T.F.W. Barth (Norway)
Secretary General: S. van der Heide (The Netherlands)
Secretary General (Associate): J. Petranek (Czechoslovakia)
Treasurer: W. von Engelhardt (F.R.G.)
Vice Presidents: F. Gonzalez-Bonorino (Argentina), R.L. Lafitte(France), H. Kuno (Japan), E. R. Uhle (Poland), T.B. Nolan (U.S.A.), V.I. Smirnov (U.S.S.R.)

1972-1976

President: P.H. Abelson (U.S.A.)
Past President: K.C. Dunham (U.K.)
Secretary General: S. van der Heide (The Netherlands)
Secretary General (Associate): J. Petranek (Czechoslovakia)
Treasurer: K. Metz (Austria)
Vice Presidents: R. Lafitte (France), J.E. Cudjoe (Ghana), G. Grasselly (Hungary), J.A. Katili (Indonesia), G.P. Salas (Mexico), I.E. Altinli (Turkey), V.I. Smirnov (U.S.S.R.)

1976-1980

President: R. Trümpy (Switzerland)
Past President: P.H. Abelson (U.S.A)
Secretary General: W.W. Hutchison (Canada)
Treasurer: K. Metz (Austria)
Vice Presidents: P.F. Howard (Australia), J.E. Cudjoe (Ghana), G. Grasselly (Hungary), J. Eftekharnezhad (Iran), T. Tatsumi (Japan), G.P. Salas (Mexico), I.E. Altinli (Turkey), V. V. Menner (U.S.S.R.)

1980-1984

President: E. Seibold (F.R.G.)
Past President: R. Trümpy (Switzerland)
Secretary General: C.C. Weber (France)
Treasurer: J.A. Reinemund (U.S.A.)
Vice Presidents: F.F. de Almeida (Brazil), S. Sheriff (Iraq), T. Tatsumi (Japan), C.A. Kogbe (Nigeria), Z. Kielan-Jaworowska (Poland), G. Kautsky (Sweden), V.V. Menner (U.S.S.R.)

1984-1989

President: W.W. Hutchison (Canada)
Past President: E. Seibold (F.R.G.)
Secretary-General: R. Sinding-Larsen (Norway)
Treasurer: J.A. Reinemund (U.S.A.)
Vice Presidents: V. Cordani (Brazil), Zhang Bingxi (China), S.K. Mukerjee (India), M. Bensaïd (Morocco), C.A. Kogbe (Nigeria), Z. Kielan-Jaworowska (Poland), G. Kautsky (Sweden), V.L. Barsukov (U.S.S.R.)

1989-1992

President: U.G. Cordani (Brazil)
Past President: W.W. Hutchison (Canada)
Secretary General: R. Brett (U.S.A)
Treasurer: M. Schmidt-Thome (Germany),
Vice Presidents: J.F. Lovering (Australia), W.C.G. Caldwell (Canada), Zhang Bingxi (China), N. Petit-Maire (France), G. Kesse (Ghana), S. Uyeda (Japan), M. Bensaïd (Morocco), V. L. Barsukov (U.S.S.R)

1992-1996

President: W.S. Fyfe (Canada)
Past President: U.G. Cordani (Brazil)
Secretary-General: R. Brett (U.S.A)
Treasurer: M. Schmidt-Thome(Germany),
Vice Presidents: J.F. Lovering (Australia), F. Hervé (Chile), Liu Dunyi(China), N. Petit-Maire (France), G. Kesse (Ghana), S. Uyeda (Japan)

1996-2000

President: R. Brett (U.S.A.):
Secretary General: A. C. Boriani (Italy)
Treasurer: Z. Johan (France),
Vice Presidents: F Herve (Chile), Liu Dunyi (China), G. Gaál (Hungary), W. Al-Hashimi (Iraq), I. Kushiro (Japan), I. Nyambok (Kenya), I. Speden (New Zealand), V. A.

Zharikov (Russia)

2000-2004

President: E. de Mulder (The Netherlands)
Secretary General: A. C. Boriani (Italy)
Treasurer: W. Janoschek (Austria)
Vice Presidents: P. T. Bobrowsky (Canada), G. Gaál (Finland), W. S. Al-Hashimi (Iraq), T. Sato (Japan), I. Nyambok (Kenya), I. Speden (New Zealand),
Councilors: 2004-2008: H.K. Gupta (India), J. Plant (U.K.); 2006-2008: A. C. Riccardi (Argentina), J-P. Cadet (France)

2004-2008

President: Zhang Hongren (China)
Vice Presidents: Sylvie Haldorsen (Sweden), Eldridge Moores (USA)
Secretary General: Peter Bobrowsky (Canada)
Treasurer: Antonio Brambati (Italy)
Councilors:
2002-2006: Jean-Paul Cadet (France), Alberto C. Riccardi (Argentina)
2004-2008: Ryo Matsumoto (Japan), Gaby Schneider (Namibia)
2006-2010: Mikhail Fedonkin (Russia), Marta Mantovani (Brasil)

2008-2012

President: Alberto C. Riccardi (Argentina)
Vice Presidents: Jacques Charvet (France), Gerel Ochir (Mongolia)
Secretary General: Peter Bobrowsky (Canada)
Treasurer: William Cavazza (Italy)
Councilors:
2006-2010: Mikhail Fedonkin (Russia), Marta Mantovani (Brasil)
2008-2012: Ezzoura Errami (Morocco), Colin Simpson (Australia)
2010-2014: Wesley Hill (USA), Tandom Sampat Kumar (India)



2012-2016

President: Roland Oberhänsli (Switzerland)
Vice Presidents: Yildirim Dilek (U.S.A.), Marko Komac (Slovenia)
Secretary General (2012-2013): Ian Lambert (Australia)
Secretary General (2013-2016): José P. Calvo (Spain)
Treasurer: Shuwen Dong (China)
Councilors:
2010-2014: Wesley Hill (USA), Tandom Sampat Kumar (India)
2012-2016: Hassina Mouri (South Africa), Yujiro Ogawa (Japan)
2014-2018: Stephen Johnston (Canada), Amel Barich (Morocco)

2016-2020

President: Qiuming Cheng (China)
Past President: Roland Oberhänsli (Switzerland)
Vice Presidents: Kristine Asch (Germany), William Cavazza (Italy)
Secretary General: Stanley C. Finney (U.S.A.)
Treasurer: Hiroshi Kitazato (Japan)
Councilors:
2014-2018: Stephen Johnston (Canada), Amel Barich (Morocco)
2016-2020: Ben Mapani (Namibia), Edmund Nickless (U.K.)
2018-2022: Silvia Peppoloni (Italy), Claudia Mora (U.S.A.)

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