



# International GeoScience Education Organisation

November 2023 Newsletter

<http://www.igeosced.org/>

## 2018 – 2022 IGEO Executive Committee

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Special Advisor: Shankar Rajasekhariah, India

**Council Members:** <http://www.igeosced.org/about-the-igeo/officers/>

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Dear IGEO members,

I am pleased to share with you the highlights of the first year of intensive activities of the IGEO Executive Committee.

### **1. GLESE (Global Leaders in Earth System Education) project**

The GLESE project was launched to identify potential national leaders in ESE and provide them with a wide range of tools for raising the status of ESE in their countries.

The program started in April 2023, and participants have already started implementing what they are learning.

### **2. The IGEO Journal – the International Journal of Earth System Education**

IGEO has completed the steps for creating a new open-access journal, the International Journal of Earth System Education. The journal aims to increase awareness of international research and education programs in Earth system education and foster collaborations among countries. If you would like to submit a paper for the inaugural edition of the journal, please contact Sharon at [slockesiue@gmail.com](mailto:slockesiue@gmail.com). We expect a June 2024 publication date for Volume 1 of IJESE!

### **3. IESO 2023**

The 16th edition of the International Earth Science Olympiad (IESO) was held on August 20-26, 2023. It had to be a virtual event as no country came forward to host due to the fear of COVID-19. In this circumstance, IGEO came forward to organize the online IESO.

IESO 2023 attracted 179 students from 32 countries. At the Closing Event, students expressed satisfaction with the unique experience and knowledge about earth system science they gained through IESO. In 2024, IESO will take place in Beijing, China, and 2025, in Bengaluru, India.

### **4. The NGO**

One of the urgent tasks of the current Executive Committee is to open a tax-exemption bank account. The only appropriate option we found for opening a tax-exemption bank account was to establish an NGO (non-governmental organization). The process was (and still is) very tedious. In September 2023, we were signed as an NGO.

Yours,  
Nir

25.11.2023

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972-545223614

## Announcements

The International Geoscience Education Organisation is pleased to announce a call for papers for the inaugural issue of the International Journal of Earth System Education (IJESE). IJESE is a peer-reviewed, open-access journal dedicated to publishing scholarly work that advances teaching and learning about the Earth's systems. IJESE welcomes submissions for review of manuscripts that describe research, programs, curriculum, and methods in Earth system science education. We encourage submissions that describe educational activities that demonstrate interconnections between systems and/or bring a global perspective to Earth system education. Publishing in IJESE is free for authors. There are no publication fees or page charges.

IJESE will publish two online issues a year. The deadline to submit manuscripts for the first issue is **February 29, 2024**, with an expected publication in August 2024.

Guidelines for authors and submission instructions are available at the journal's website:

<https://ijese-journal.igeoscienced.org/index.php/ijese/index>

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"Dr. R. Shankar, Advisor, IGEO has been invited to be a Member of the School Syllabus & Textbook Committee of NCERT (India). Shankar hopes to get Earth Science its visibility and importance in the school syllabus and have it as an elective subject in the 11th and 12th standard syllabus. When taken out of the clutches of Geography and Social Studies, Earth Science will be seen and taught as a science subject, and by science teachers."

## **International Earth Science Olympiad (IESO) 2023 – A Report**

by R. Shankar, Co-ordinator, IESO

The 16th edition of the International Earth Science Olympiad was held during August 20-26, 2023. It had to be a virtual event as no country came forward to host due to the lurking fear of COVID-19. Interested individuals came forward to organize activities for IESO; they planned and propelled the event and also constituted the IESO Steering Committee (Nir Orion, Chair; Rajasekhariah Shankar, Co-ordinator; Xavier Juan, Bing Shen, Greg McNamara, Tiago Ribeiro, and Sharon Locke, Members).

The theme for IESO 2023 was “The present is the key to the past”.

Despite being virtual, this year’s event attracted considerable participation: 179 students, 12 guest students, 56 mentors and 26 observers hailing from 32 countries. Registration of teams was the responsibility of Tiago Ribeiro.

The Opening event held on the 20th of August, Shankar welcomed the participants and gave a brief introduction to IESO 2023. Shankar, Bing, Nir, Greg and Susanna gave brief introductions to the activities that they oversaw. Nir, from his distinguished position of Chair, IGEO and IESO, gave his remarks on earth science education and how IESO has been contributing in that direction.

A brief account of the activities conducted is given below. More details at [www.igeoscienced.org/activities/ieso-2/ieso2023/](http://www.igeoscienced.org/activities/ieso-2/ieso2023/)

### **National Team Field Investigation (NTFI) (In charge: Nir Orion):**

NTFI is similar to International Team Field Investigation (ITFI) but adapted to the virtual edition of IESO where only four, not six-eight, students of a national team conduct field investigations. It is a miniature study of a concrete earth system phenomenon in a field site that combines limited field and lab studies in the short time available. The essence of NTFI is the ability to formulate a focused research question involving the earth system approach and an environmental component. Up to date field instruments and lab investigations are used to collect data; alternatively, a long-term data set may be provided following a one-time measurement at the field site. Results of the investigation are presented by the team, which will be evaluated by an international jury.

### **Earth System Project (ESP) (In charge: Rajasekhariah Shankar):**

Earth System Project is a co-operative activity of IESO wherein groups of students hailing from different nationalities, diverse cultures and varied backgrounds work together on a topic that encompasses many spheres of the Earth System – Much the same way earth scientists hailing from different countries work today. Students research on an assigned topic by collecting, analysing and reasoning out the data. They also must make earth systems connections. They will make a poster/PowerPoint presentation which will be adjudicated by an international jury based on a rubric. ESP lays special emphasis on the development of the following scientific skills: data collection, data analysis, reasoning, system thinking, communication and collaboration, and oral and written presentation.

The following four topics were offered in IESO 2023:

1. El Niño 2023 and the earth systems
2. Permafrost thaw
3. 2023 ocean surface temperature records and
4. The case for/against terraforming Mars

### **Data Mining Test (In charge: Bing Shen):**

Data Mining Test (DMT) evaluates students’ ability to understand the principles by checking online materials, analyse the data and draw conclusions, given the geological data and background. In DMT, individual students will be asked to explore online data accessed via links provided after which they have to answer certain questions sequentially. This involves simple calculations, which.

can be done using a calculator, and more complex ones which can be done online at the website provided. High school level mathematics knowledge is sufficient. Students can learn the principles and methodologies involved in the calculations; this knowledge can be applied to solve problems. an international jury will check the answers.

**Art in Earth Sciences** (In charge: Greg McNamara):

Art in Earth Sciences provides a platform to IESO participants to demonstrate the interconnectedness of science. Participants could submit up to three works of art that are related to Earth Science, and could take the form of Art and Graphic design (created by hand or by digital processes); Photography (unaltered images, software manipulated images and blended images); Poetry and prose in written form; Sculpture; Film/Video; Music/Audio (e.g., Song, Instrumental, Spoken word); Mixed media (e.g., Film of a kinetic sculpture accompanied by poetry or music). Entries were received through Padlet website were moderated and displayed for the IESO community to admire. Entries were judged by an international jury as well as by IESO peers.

**IESO Pledge** (In charge: Susanna Occipinti):

ES Pledge is an activity that offers IESO participants an opportunity to express their ideas and plans on how they intend to utilise their earth science knowledge and experience, for example, in tackling global problems that are affecting humanity, and how earth science education can benefit society. The IESO pledge could be in the form of a short-written text or a video clip posted on a social medium of the student's choice. Links to all IESO Pledge entries were published on the IESO website to enable everyone to go through them. An international jury adjudicated entries.

For IESO 2023, participants could present (individually) his/her ideas centred around one of the following questions:

1. Why should students worldwide study ES
2. How did studying ES influence my knowledge and skills, and
3. Why I think ESE can help society in addressing global problems and issues.

Curtains came down on IESO 2023 on August 26th. At the Closing Event, Shankar welcomed the participating teams and requested three mentors and three students to give their impressions on IESO 2023. They expressed satisfaction about the conduct of the event knowing full well that it was an online event.

One opinion was to have offline edition soon as earth science in particular needs face-to-face interactions and field studies. (This will be possible in 2024 and 2025). Students were particularly excited about their unique experience of interacting and working, though virtually, with their counterparts from other parts of the world. They were happy to have gained unique experience and knowledge about earth system science through IESO.

This was followed by remarks from Nir, the Chair, IGEO and IESO. He also announced that the next edition of IESO will be held in Beijing, China during August 2024. Bing Shen made an impressive presentation on the host city and institution (Beijing and Peking University) and the activities planned for the next year's event. A bid was received from India to host IESO 2025 in Bengaluru jointly by PRAYOGA Institute of Science Education and Jain International Residential School. Due to paucity of time, it was suggested that voting will take place after the IESO. (Mentors unanimously accepted the bid.)

**Results of the activities** <http://www.igeoscienced.org/activities/ieso-2/list-of-medal-and-team-award-winners/>

were announced by people who were in charge. Everyone cheered for the medal winners and awardees; but others were told that they too were winners as they had come through the rigor of testing and reached the final stage. Shankar thanked everyone for their participation. Grateful thanks go to the Chair and members of the Steering Committee for their time, energy and efforts (and sitting through meetings at odd hours), the Weizmann Institute of Science, Israel for the Zoom platform, volunteers from PRAYOGA and Shwetha for their help in ESP. The event ended with a sense of achievement and satisfaction that we will have offline IESO in 2024 (Beijing, China) and in 2025 (Bengaluru, India).

International Geodiversity Day celebration at Prayoga, Bengaluru.

October 6, 2023

The International Geodiversity Day was celebrated at Prayoga Institute of Education Research

International Geodiversity Day celebration at Prayoga, Bengaluru.



October 6, 2023

The International Geodiversity Day was celebrated at Prayoga Institute of Education Research

(PIER; [www.prayoga.org.in](http://www.prayoga.org.in)), Bangalore, on October 6, 2023. The program was conducted for interested research and administrative staff of PIER.

There was no formal inauguration, no banners, no posters, no formal speeches. The program was comprised mainly interactions, field study followed by a PowerPoint presentation and

discussion. To start with, a few questions were posed. These and the participants' answers are given below:

Q: Have you heard of Biodiversity?

A: A resounding YES from all participants.

Q: Have you heard of Geodiversity?

A: A unanimous NO from all but one participant.

Next, the participants were asked to list all items that they see in the training hall, on the campus of PIER, on the way to and during the field trip. They were asked to categorize the

items as (a) relating to or derived from Planet Earth, and (b) not relating to or derived from Planet Earth.

The participants were taken to two field sites (sites 1 and 2, Fig. 1). The main field site was near a dam across Suvarnamukhi River near Bolare Village. During the field trip, participants were (PIER; [www.prayoga.org.in](http://www.prayoga.org.in)), Bangalore, on October 6, 2023. The program was conducted for interested research and administrative staff of PIER.

To start with, a few questions were posed. These and a summary of the participants' answers are given below:

Q: Have you heard of Biodiversity?

A: A resounding YES from all participants.

Q: Have you heard of Geodiversity?

A: A unanimous NO from all but one participant.

Next, the participants were asked to list all items that they see in the training hall, on the campus of PIER, on the way to and during the field trip. They were asked to categorize the items as (a) relating to or derived from Planet Earth, and (b) not relating to or derived from Planet Earth.

The participants were taken to two field sites (sites 1 and 2, Fig. 1). The main field site was near a dam across Suvarnamukhi River near Bolare Village. During the field trip, participants were taught how directions of river flow and inclination of rocks can be determined using a magnetic compass. They were encouraged to make observations and take photographs of whatever interested them. Some of these photos are in Figs. 2-5.

On returning to the campus (Fig. 6), the participants discussed the items they had listed (air, water, soil, rocks, plants, trees, grass, animals, birds, vegetables, fruits, plastic bottles, cars, diesel etc.). Soon, they realised that all the items were indeed related either directly or indirectly to Earth. They were able to categorise the items as living and non-living, which respectively were nothing but geodiversity and biodiversity! More questions were posed:

Q: Can biodiversity survive without geodiversity?

A: No.

Q: Can geodiversity survive without biodiversity?

A: Yes.

Q: Which came first, geodiversity or biodiversity?

A: (by some) Geodiversity. (Information on the origin of earth and life was provided.)

A PowerPoint presentation (Fig. 7) helped them to consolidate their impressions and provided clarity on the concept of geodiversity, and get a flavour of some national geological monuments of India and their importance in terms of the history of the earth, evolution of life, India's journey from Antarctica, etc. Concepts of geoconservation and geotourism were discussed, besides providing geoscience education from field observations.

Feedback from the participants showed that they did not know the importance of geodiversity; the activity was eye-opening for them. A one-day program for high school students is planned after they return from mid-term vacation.

R. Shankar, Adviser

Biraj Borgohain, Senior Researcher

Ajit Singh, Principal Researcher

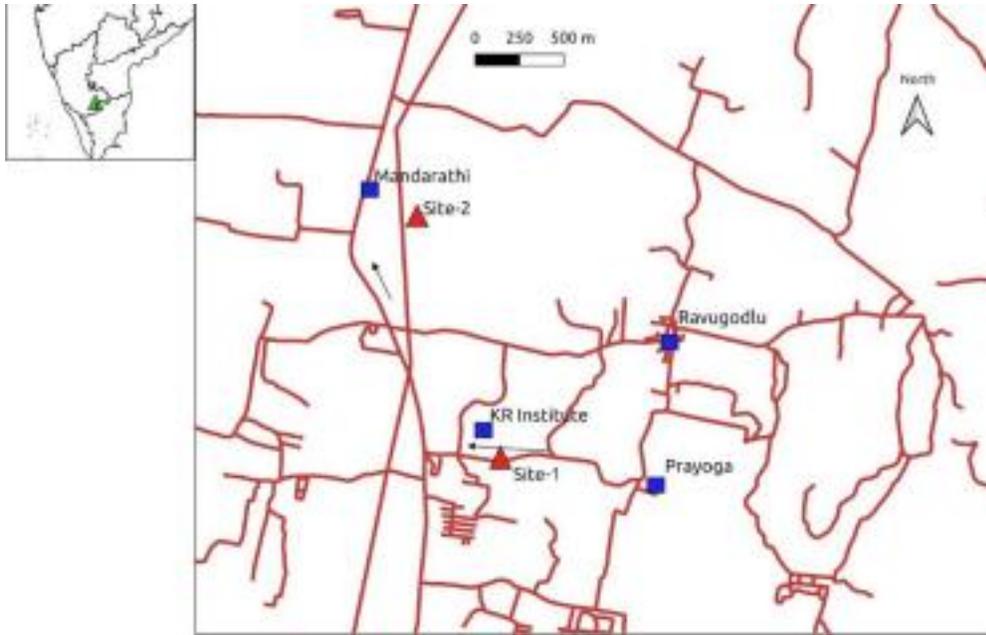


Figure 1: Simplified map of the area around PIER and locations of field visit (red triangle). These locations contain rich geodiversity as well as biodiversity.



Figure 2: Participants at the field site. Peninsular gneiss outcrops can be seen.



Figure 3: Site 2

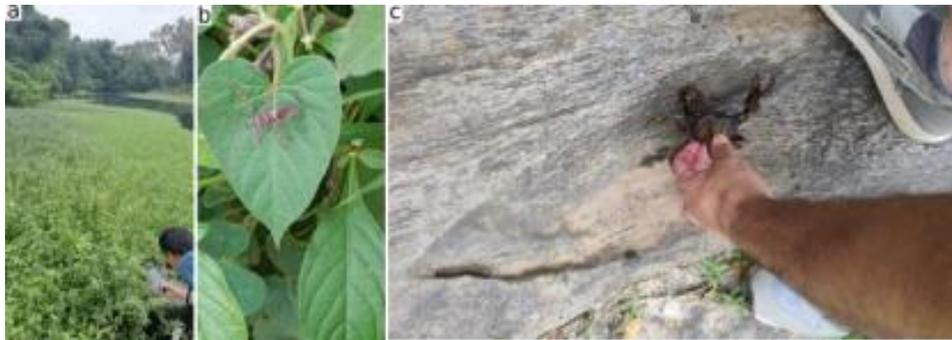


Figure 4: Participants observed both the biodiversity and geodiversity of the two sites.



Figure

5: (a) Google Earth image of site 2, showing a mafic dyke cutting through Peninsular gneiss. (b) A panoramic view of site 2, (c) Contact between the mafic dyke and gneissic rock, (d) Mafic dyke, and (e) Banding in the gneiss.



Figure 6: Participants at the end of the Geodiversity program.



Figure 7: Presentation and discussion by Prof Shankar with participants after the field trip

## IV Earth2Class em Diamantina

(aka 1st Student Conference on Climate Change in Brazil) – Report

by Michael J. Passow

Brazil has one of the largest economies in the world. It is the fifth largest country in area and seventh in population. Because of its enormous size and geologic history Brazil gains many benefits from mining and agriculture. When it was a colony of Portugal, the economy focused on such goods as gold, diamonds, sugar, and cotton. Later, agriculture became important, leading to major immigration from Italy, Germany, and Japan. More recently, Brazil has become a major producer of steel and petroleum. In its agricultural sector, Brazil is the world's top producers of coffee, soy, oranges, guaraná, açaí, and Brazil nut. It also ranks near the top in global production of maize, papaya, tobacco, banana, pineapple, bean, coconut, watermelon, and lemon, as well as cashew, avocado, cocoa, tangerine, mango, guava, rice, sorghum, tomato, apple, grape, peanut, fig, peach, onion, palm oil, and natural rubber.

But what might happen in the future under a changing climate? As in any country, the future decision-makers are today's college students. Many of you who know me are aware I have visited Brazil numerous times in the past two decades, and established friendships with Brazilian academics. Together with like-minded individuals, we organized a conference at UFVJM (the Universidade Federal dos Vales do Jequitinhonha e Mucuri in Diamantina, Minas G, Brazil) in October 2023 to introduce and expand student understanding of potential impact of climate change on the Brazilian economy and environment.

Brazil has an ethnically, culturally, and socio-economically diverse population. The covid-19 pandemic has had a major impact, slowing the upward trends in educational parameters that occurred during much of the past century.

The UFVJM host was Dr. Douglas Sathler, a geography professor whom I first met when he was at Columbia University. Columbia has established eleven Global Centers around the world (<https://globalcenters.columbia.edu/>), including one in Rio that focuses on climate change in Brazil (<https://globalcenters.columbia.edu/rio>). Climate

Hub Rio sent Laryssa Nunes to the conference to describe program available in Rio and opportunities for Brazilians to study in New York.

The conference opened with a brief description of the EarthClass (E2C) program ([Earth2Class | Bringing Earth Science to the Classroom](#)) I organize at Columbia and three previous programs at UFVJM (hence the IV in the title for the conference). One key feature of E2C I the willingness of local research scientists to share their investigations with participants. For IV em Diamantina, Douglas persuaded his colleague, Alexandre Christófaro Silva, a soils professor at UFVJM, to discuss his investigations into peatlands.

Peatlands are terrestrial wetland ecosystems where waterlogged conditions halt the full decomposition of organic matter. In cooler climates, the main components forming peat include *Sphagnum* mosses, sedges, and shrubs. *In warmer climates*, grasses and woody vegetation produce peat. On some countries, such as Ireland, peat has long been used as a major fuel source, but naturally it serves as an important absorber of carbon dioxide, and thus plays a role in climate change processes. Dr. Silva gave a talk about peatland (known as turfeiras in Portuguese) and then led a hike to the nearby Biri-Biri State Park to core into the turfeira and let students hold the dark material in their hands.

This type of event is easily duplicated elsewhere at minimal cost. Planning is beginning for future E2C em Brasil programs to be hosted by Columbia Climate Hub in Rio, which will explore other aspects environmental education and the impact of climate change in Brazil.



Participants in IV Earth2Clazz em Diamantina



Prof. Alexandre Christófaro Silva at IV Earth2Class em Diamantina



Laryssa Nunes of Columbia Global Center Rio at IV Earth2Class em Diamantina

## Soil screening for lead by high-school students in Peru

Alexander van Geen<sup>1</sup>, Franziska Landes<sup>1</sup>, and Johny Ponce<sup>2</sup>

<sup>1</sup>Lamont-Doherty Earth Observatory of Columbia University, Palisades, NY 10964, USA  
(<https://www.ldeo.columbia.edu/>)

<sup>2</sup>Center for Research in Environmental Health, CREEH, Lima, Peru (<https://creehperu.org/>)

Infants ingesting soil contaminated with lead (Pb) from old paint, mine tailings, fallout from smelting, and battery recycling can suffer from reduced intellectual development, behavior problems in school, and lower earnings later in life. This has been shown by numerous studies and is widely accepted. Across the world, child exposure to Pb has fortunately also declined substantially in recent decades because of the phasing out of Pb-paint and Pb addition to gasoline. What is much less clear, however, is how to address most effectively the less frequent but still substantial cases of infant exposure to Pb around the world.

A key reason Pb exposure is difficult to redress is lack of data. Monitoring of blood-Pb levels in infants is standard practice in only a small number of countries. Such monitoring also reveals exposure only after it has occurred. A better way to prevent exposure is therefore to monitor the environment for potential sources of Pb instead. Here the difficulty is patchiness. One room in an older house may contain old peeling Pb-paint and the other not. One yard or park may be contaminated with Pb from tailings or other sources and the other not (Filippelli et al., 2018; Landes et al., 2019a). The only way to find out is to evaluate such areas.

Fortunately, this is where geoscience educators and their students can play an important role. The key ingredient for detecting high levels of Pb in the environment is sodium rhodizonate, which is quite sensitive and specific. It is used in a commercial kit for Pb in paint manufactured by 3M ([https://www.3m.com/3M/en\\_US/company-us/all-3m-products/~/All-3M-Products/Consumer/Home-Improvement/LeadCheck-Swabs/?N=5002385+8709316+8711017+8740610+8753945+3294857497&rt=r3](https://www.3m.com/3M/en_US/company-us/all-3m-products/~/All-3M-Products/Consumer/Home-Improvement/LeadCheck-Swabs/?N=5002385+8709316+8711017+8740610+8753945+3294857497&rt=r3)). Rhodizonate has been used to detect Pb glaze, which is occasionally still used in Latin America, and as a red indicator in wet wipes ([https://www.skincinc.com/catalog/index.php?cPath=600000000\\_601000000\\_601000050](https://www.skincinc.com/catalog/index.php?cPath=600000000_601000000_601000050)). Rhodizonate is also the basis for a simple procedure that has been used to screen soil for hazardous levels of lead from around the world (Landes et al., 2019b).

The procedure has been used by high-school and college students to assess park and backyard soil in New York City (<https://blogs.ei.columbia.edu/2017/10/09/many-backyards-in-brooklyn-neighborhood-are-contaminated-with-high-levels-of-lead/>). The procedure has also been adapted for deployment by high-school students as part of their science curriculum in Peru, where the impact of exposure to Pb on cognitive has also been demonstrated (Vega-Dienstmaier et al., 2006). Until the pandemic hit the country in April 2020, a total of 2500 samples had been collected and screened by 1171 students from 11 high schools under a project funded by USAID ([https://sites.nationalacademies.org/PGA/PEER/PEERscience/PGA\\_181437](https://sites.nationalacademies.org/PGA/PEER/PEERscience/PGA_181437)). The students sieve soil samples in the field samples, register GPS coordinates and site photos on a smartphone, and analyze them at school under supervision (see photos below). The results are subsequently verified by measuring the total Pb content of the soil samples by X-ray fluorescence, after which all the results are mapped by the students and presented to the community. Geoscience educators around the world where Pb exposure from paint or soil could be an issue may want to consider involving their students in a similar project!

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Photos showing (left) soil sample collected by student from Columba Pasco school and (right) soil extraction analyzed by students from Ricardo Palma school, both in Cerro de Pasco, Peru. Credit: CREEH.