ASSOCIATION OF GEOSCIENTISTS FOR INTERNATIONAL DEVELOPMENT (AGID)

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From Editor's Desk:

It is with great pleasure that I am publishing the 75th issue of AGID newsletter which started in 1986 as AGID's Asian Geoscience Newsletter, under encouragement and financial support from AGID Council, especially from Dr. Jon Rau, Prof. Roger Blais and Dr Antony Berger. The Newsletter was initially published four times a year. The frequency was reduced to thrice a year and finally to twice a year. I hope to continue the publication till the 36th International Geological Congress (IGC) in New Delhi in February 2020. It is likely that AGID may be closed during the 36th IGC.

As in other IGCs, AGID had planned to submit to the Organizing Committee (OC) of 36th IGC a full Theme titled: "Geoscience for economic development of low-income countries" comprising six sessions viz: (1) Ground water development for food security, rural employment and rural health. (2) Mining for economic progress – Eco friendly & sustainable mining (3) Geo-hazards mitigation (4) Geoscientists and Environmental Protection including watershed development and (5) Geo Parks, Geo Heritage & Geo tourism, Role of women geoscientists. And (6) "Socio-Geology: How to take our Science to the Society – especially the Socio-Hydrogeology to rural Society or to the farmers who use almost 70% of the available ground water?"

However, after the 1st Circular was available on-line, it was observed that all the Themes had been finalized and Theme Coordinators had been already appointed from the geologists working with Government Departments/Institutions and with Universities in India. I have protested to the OC about this total *'Indianization'* of the IGC's Scientific Program, which has been finalized without leaving any scope for the global Associations/ Institutions/ and Experts to propose Themes and become Theme coordinators. In previous IGCs the OC had given an open invitation over the website, to submit Theme proposals about 2 years prior to the event. AGID could therefore actively participate in IGCs in Rio (2000); Florence (2004), Oslo (2008), Brisbane (2012) and Cape Town (2016). Theme champions (coordinators) and Session Conveners from AGID team got a generous financial support from the OCs of the IGCs mentioned above. It remains to be seen how AGID could actively participate in the 36th IGC in New Delhi in 2020. I and Ms. Afia Akhtar, AGID President, are trying our best through Prof. O.P. Varma, very senior and highly influential geologists from Roorkee, India, who is also the Life Member of AGID. Prof. V.P. Dimri, the President of the 36th IGC, happens to be a student of Prof. Varma.

Lastly, I would like to thank the newly elected Council of IUGS for the grant of $700 to AGID in the year 2018. A part of this support would be used in preparations for the **mega-event "Geoscience for Society (GeoSoc)"** which AGID President Ms. Afia is organizing for AGID in Dhaka in March 2019. GeoSoc has been approved by the Government of Bangladesh and cosponsored by GSB (Geological Survey of Bangladesh); IGEO (International Geoscience Education Organization); IUGS (International Union of Geological Science); SAAWG (South Asian Association of Women Geoscientists) SEGMITE (Society of Economic Geologists and Mineral Technologists), AAWG (Association of African Women Geoscientists); GIGE (Gondwana Institute for Geology and Environment); GSA (Geological Society of Africa); IAGR (International Association for Gondwana Research); IAPG (International Association for Promoting Geoethics, Rome) and IGC (Indian Geological Congress, Roorkee, India).

Dr Shrikant Daji LIMAYE

Past President of AGID & Hon. Editor

ENVIRONMENT

Californian farmers produce virtually the entire US almond crop and dominate the international market. As the market has grown, almonds have become California's largest single crop—now accounting for about 12% of irrigated acreage, with more than 1.2 million acres harvested in 2016. Availability of water is clearly a major issue for the industry, since the trees must be irrigated throughout the long spring and summer dry season. At an event on water issues organized in May by the Almond Board of California, the following water realities became obvious which the almond growers must grapple with in coming years.

- Growers in the San Joaquin Valley must address a long-term groundwater deficit. More than 80% of almond acreage is in the San Joaquin Valley. Decades of unchecked pumping in the valley have resulted in a chronic groundwater deficit averaging nearly 2 million acre-feet per year. Groundwater sustainability agencies must now devise plans to comply with the state's 2014 groundwater law by bringing their water supply and use into balance over the next two decades. This means both augmenting supplies and reducing water use. Almond growers—along with others—need to be engaged in this process.

- Augmenting local supplies could be done by almond growers: Up to a quarter of the San Joaquin Valley's groundwater deficit could be eliminated by replenishing aquifers during high-flow events and wet winters like 2017. Spreading water on farmland is a cost-effective way to capture this water. Almond orchards are good candidates for such a process, given the suitability of much of the land for recharge. Moreover, almond trees are dormant in winter and early spring, when extra water is most often available. Pilot projects and groundwater-recharge research are helping establish best practices and addressing ongoing questions among growers about the impact of winter flooding on almond crops. Almond growers also need to support other types of groundwater banking projects—such as recharge basins—that can help maximize available water supplies.
- Managing demand will also be essential for reaching sustainability. Water use will need to fall to reduce the groundwater deficit. While this will pose some challenges, the good news is that farmers have been managing water demand for decades in this water-scarce region. Since the early 1980s, irrigated crop acreage in the San Joaquin Valley has hovered around 5 million acres, while the value of valley agriculture has roughly doubled (in today's dollars). Farmers have responded to water scarcity by investing in crops and practices that generate more dollars per drop. The expansion of crops like almonds—and the corresponding decline in cotton and other field crops that bring in less revenue—reflect this shift. *(Editor's note: Ground water management through augmenting aquifer recharge and reducing demand through efficient irrigation methods is equally applicable in other areas of the world having over-exploited aquifers.)*

G E O L O G Y

Erasing a Billion Years of Geologic Time across the Globe

The Great Unconformity—a huge time gap in the rock record—may have been triggered by the uplift of an ancient supercontinent, say researchers using a novel method for dating rocks.

"Tectonicist Michael DeLucia stands in front of the Great Unconformity in the St. Francois Mountains, near Missouri's Mark Twain National Forest, USA. The smooth rock in the photo is Precambrian rhyolite, whereas the chunky rock layer above is Cambrian sedimentary rock. Missing between these two layers is 1 billion years of geologic time. Credit: Stephen Marshak"

The Great Unconformity (GU) is one of geology's deepest mysteries. It is a gap of missing time in the geological record between 100 million and 1 billion years long, and it occurs in different rock sections around the world. When and how the GU came to be is still not totally resolved.

Now a team of researchers studying the unconformity as it occurs on the Ozark Plateau in the United States has found chemical evidence in rocks suggesting that the GU began forming toward the end of the Precambrian, between about 850 and 680 million years ago. Their evidence implies a culprit behind all of the missing rock: global tectonic uplift associated with the breakup of the ancient supercontinent Rodinia.

"This means there was probably a boatload of erosion." Forces of nature seek to even out large differences in topography, the researchers explain in a recent paper published in the journal *Geology*. Any sudden large-scale uplift, they

posit, would have exposed relatively more Rodinian rock than normal to weathering and erosion.
The new evidence points to 6–8 vertical kilometers of fresh rock material uplifting at the end of the Precambrian. “This means there was probably a boatload of erosion,” explained Michael DeLucia, Tectonicist of the University of Illinois at Urbana-Champaign and lead author of the work. As time passed, this weathering and erosion carved the GU.

Earth scientists Stephen Marshak and William Guenthner look at a contact between rhyolite and granite in Missouri. These rocks rest below the Great Unconformity boundary as it occurs on the Ozark Plateau in North America.

Where the GU horizon exists on the planet, the difference in rock type above and below the horizon is striking: In the Grand Canyon, the Precambrian Vishnu Schist is warped and twisted compared to the Cambrian Tapeats Sandstone that overlies it. On the Ozark Plateau, at the team’s field site in a region called the St. Francois Mountains, 1.4-billion-year-old granite and rhyolite lies directly underneath 500-million-year-old sandstone.

Geology and the Sustainable Development Goals

In September 2015 the Sustainable Development Goals (SDGs) were formally adopted by member states of the United Nations. Building on the Millennium Development Goals, these 17 ambitious goals aim to end global poverty, fight injustice and inequality, and ensure environmental sustainability over a 15 year timeframe (2015-2030)

The 17 Sustainable Development Goals (2015–30)

Achieving the SDGs by 2030 will require many sectors to engage, including the geological sciences. Many of the themes within the SDGs are pertinent to geological research and practice. This gives all of us an exciting opportunity to take a leading role in promoting and facilitating responsible Earth stewardship, ensuring sustainable and equitable foundations for future global development. Geology students, educators, researchers, industry professionals, public servants and policymakers can all contribute to the achievement of the SDGs.

Groundwater development and sustainability: Concerns in Himalayan Hills

Earlier, the population in the Himalaya's hilly areas remained totally dependent on streams and spring water for drinking as well as for other domestic uses. However, urbanization and increase in population have put pressure on these water resources, which are now increasingly becoming scarce. Industrial growth and tourism in the plains also contributes to the adverse effect on the region's groundwater sources.

For example, there have been instances of contamination of shallow aquifers in Uttarakhand and Himachal Pradesh as many industries have been found to discharge their untreated effluents directly to nearby water bodies. This greatly affects the quality of water available for potable purposes in the area.

Harsh climatic conditions, erratic rainfall, snow, freezing of water in pipes and the lack of irrigation facilities leads to disruption of water supply in various seasons. High iron and fluoride content in some parts have rendered the water in the area unfit for drinking.

Strategies to deal with the Himalayan groundwater concern

Finding groundwater resources located at greater depths in addition to restoring the health of the streams in the area is one alternative. Encouraging rain water harvesting along with the locating deeper sources and restoring the health of springs is being contemplated as solutions to ensure sustainable supply of water.

Efforts need to be made to arrest optimum surface run-off and harvest maximum rainwater through:

- Suitable conservation techniques that include hill and catchment area treatment.
- Grass plantation, forestry development and stopping the grazing activities to reduce soil erosion as also to enhance the groundwater recharge.
- Identifying cavernous limestone areas in Himalayas that can be used for groundwater storage.
- Exploring the option of procuring groundwater through tube wells, dug wells or bore wells depending on the topography of the region as an alternative to springs and streams in times of water scarcity for consumption as well as irrigation.
- Encouraging the development and revival of springs and protect the existing perennial springs.
- Conserving rainwater by adopting suitable methods according to topography that include roof top rainwater harvesting and encouraging rainwater harvesting measures like construction of ponds, percolation tanks, check dams and contour bunds on gentle slopes or foothills, slope terracing in high slopes and bench terracing and cultivation on steep landscapes

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