ASSOCIATION OF QUATERNARY RESEARCHERS

Society Reg. No. LUC/08076/2019-2020

2023-2024

Annual Report

Association of Quaternary Researchers (AOQR)

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FROM THE PRESIDENT'S DESK

Dear Quaternary Family,

The QuatChron newsletter volume 5 (1), the April issue, is here. Thanks to our ECR team, who meticulously worked and successfully compiled this issue bang on time. It contains the Quaternary science news of the last three months (December 2022–March 2023) with reference to the Indian Subcontinent. Apologies if something is missed.

The last four months have been busy. Just after the 3rd Foundation Day, we had a successful 4th Paleoanthropology Field School/Workshop conducted in Tapi Valley, organized by CHARUSAT, IISER Mohali and AOQR in December 2023, NT-PALEO in Pune during January, organized by the IITM, Pune; followed by the General Body meeting of the AOQR in Kerala, hosted by Department of Geology, Christ College (Autonomous), Thrissur; and recently, the international field workshop LEM-2023 that has been very successful. Participants from across our country, Nepal, and Sri Lanka also participated in LEM-2023. I congratulate the organizers and thank the sponsors of all the training programmes / workshops in these last four months. AOQR will be happy to jointly organize such programmes with your Institute / University in the future and request you to come up with similar proposals. Reaching out to all Quaternary researchers is one of the objectives of this association, and we need your support.

The 2nd Indian Quaternary Congress (IQC) will be hosted by IISER Mohali in February/March 2024. Very soon, the First Circular will be released. The congress will encompass all aspects of the Quaternary Research from both the terrestrial and marine domains. On behalf of the organizers, I invite all of you to participate in this second IQC. In this volume, you will see 8 PhDs that were awarded in the last four months in various Universities across India in Quaternary Science. I congratulate all the researchers for their hard work.

AOQR mourns the death of Dr. Rajesh Agnihotri, a young Quaternary scientist from BSIP, Lucknow. He was a great researcher who lived for science. We will all miss him.

- Dr. Vandana Prasad

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AOQR MEMBERSHIP CALL

Researchers of Quaternary Science of Indian sub-continent are welcome to submit your application. Be a part of a multidisciplinary team of researchers, and practitioners of Quaternary Science and represent Indian Quaternary Science at an international level. Members can get priorities at our annual e-conferences, publish in the edited books/ journal volumes by the members of the AOQR, access to webinars, e-conferences and specialized thematic workshops etc.

Write to us at **aoqr2019@gmail.com**
for membership application form.
The membership of the AOQR is open to all individual of academia and industry subject to verification.

Welcome!

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COP27:

Breakthrough agreements and step towards a future climate resilient world.

The widespread and intensifying threats of climate change are increasingly affecting humans, animals, as well as the world ecosystems across the globe. Addressing climate related threats requires collective/coordinated and strong actions and solutions from key stakeholders at the global level. Under the United Nations Framework Convention on Climate Change (UNFCCC), the 27th session of the Conference of Parties (COP27) November 06-18, 2022, in the Arab Republic of Egypt (Sharm el-Sheikh). The objective of the conference was to build upon previous successes and pave the way for future solutions to effectively tackle the threats of global climate change. The theme of the conference, "paving the way for future ambition to effectively tackle the global challenge of climate change" drew stakeholders from across the globe to rise to the occasion and tackle effectively the global challenge of climate change. The conference also allowed teachers, students and researchers from across the world to meet over a global online discussion to share ideas, solutions, and innovative projects for a future climate resilient world. Interestingly and for the first time, indigenous people, local communities, and civil society also highlighted how they are collectively addressing global climate shifts and shared stories of how it affects their daily lives.

The key takeaway from COP27 requires all countries to make an extra effort to address the current and future climate crisis.

The five key decisions taken during this conference include;

1) Establishing a dedicated loss and damage fund particularly for the vulnerable countries hit hard by climate related disasters such as floods, droughts and unusual weather patterns.

2) maintaining a better intention to keep the world within the 1.5 °C goal.

3) holding business and institutions to account that deals with the accountability of commitments made by the public sectors, businesses and institutions.

4) mobilizing more financial support for developing countries towards accounting for low emissions and climate resilient development for combating the threats of climate change.

5) making the pivot towards implementation of concrete actions for a climate resilient world.

SNEAK-PEEK & DISCUSSION

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COP27:

The decision to create a "loss and damage fund" for vulnerable developing countries hit hard by climate disasters was added to the official agenda and adopted for the first time at COP27. This decision was particularly hailed by UN Secretary-General António Guterres, who believes that "the world still needs a giant leap on climate ambition."

Although the conference was held under the current difficult geopolitical scenarios, COP27 resulted in countries delivering a package of decisions that reaffirmed their commitment to limit global temperature rise to 1.5°C and to cut greenhouse gas emissions in order to adapt to the inevitable impacts of the global climate crisis. The COP27 clearly recognized the gravity of the current and future global climate challenges and the obligation to value collective, multilateral, and strong action plans as the only means to address the global climate threats that are at bay. To achieve this, it was pressed upon to strengthen the collaboration and communication between governments, research institutions, the public sector, and more importantly, the civil society—which is highly vulnerable to global climate threats. This will allow the development of effective strategies and help shape the commonly agreed policies by different climate institutions for achieving global sustainability. At COP27, greater emphasis was particularly given to urge the regional governments to not only listen to the solutions put forth by young people, but to incorporate these solutions in decision and policy making for a future climate-resilient world. The COP27 President Sameh Shoukry was quoted as saying, "despite the threats we still face humanity still has a chance to overcome this hard stage that if we have the political will to work together in unison….the contribution of civil society has also increased….we still have a chance to overcome these threats that actually jeopardizes the lives of millions all over the globe… it is high time that we work and implement together for the sake of humanity and our planet."

Climate scientists across the globe hailed the historic decisions taken at COP27 but still feared that some of the actions, such as safeguarding the food crisis and decarbonization, are not yet supported by effective actions. However, there was one silver lining: deliberations continued on setting up a new collective and well-quantified goal on climate finance in 2024, taking into account the needs and priorities of the developing world. The next session, i.e., the 28th Conference of the Parties (COP 28), will convene from November 30 to December 12, 2023, in the United Arab Emirates.

PhD Awarded

Lamginsang Thomte
Birbal Sahni Institute of Palaeosciences, Lucknow

Thesis title: Climate signals from multiple tree-ring parameters of Pinus kesiya from Northeast India.

Supervisors: Dr SK Shah (BSIP, Lucknow) and Prof AK Bhagabati (Geography Department, Gauhati University)

The rising global temperatures have led to an intensification in the frequency and magnitude of extreme weather events like droughts, heatwaves, and floods. In response to these events, forests around the world have been reported to exhibit shifts in their distribution and timing of growing season, flowering and fruiting. There has also been a documented increase in instances of forest mortality in various parts of the world. As already witnessed in recent times, the earth's accelerating warming is having increasingly severe socioeconomic and environmental implications. In order to understand and effectively mitigate the impacts of a changing climate, we require longer records of climate beyond the existing short instrumental observations.

In the present study, tree-rings of Pinus kesiya (Khasi pine) from northeast India were selected in order to further evaluate their utility as a proxy for past climate. Prior studies from the natural range of Khasi pine in Southeast Asia have already evaluated its potential as a palaeoclimatic proxy using the standard total (tree-)ring width parameter. In this study, the seasonal wood i.e., earlywood width and latewood width parameters were

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also assessed for the first time in addition to the total ring width. The present research work is based on what is currently the largest network of Khasi pine chronologies from India, consisting of 15 sites encompassing the (sub)tropical region of Northeast India. A total of 47 total and partial ring width chronologies were developed from these 15 sites, consisting of 12 total ring widths, 12 earlywood widths, 12 latewood widths, and 11 adjusted latewood width chronologies. The climate-growth response correlation using both gridded daily and monthly climate for the total ring width and earlywood revealed a broadly consistent pattern of direct (inverse) relationship with rainfall (temperature) during the winter (pre-monsoon) season. Conversely, the climate-growth response correlation for the adjusted latewood width index was not consistent between sites, likely due to the high variability (hence, lower correlation) in the latewood growth even between trees within a site. There is however a significant influence of climate during June and/or July in several sites, as evident from the correlation analysis. The potential isolation of this early summer climate signal would likely require massive sample replication and careful selection of samples in future studies.

The positive (negative) relationship between tree growth with rainfall (temperature) is generally interpreted as the presence of a prominent moisture signal in the tree-ring proxy. Consequently, a high correlation was observed between tree-ring parameters (total ring width and earlywood) and the gridded self-calibrated Palmer Drought Severity Index (scPDSI), a proxy of soil moisture and a widely used metric of drought. The spatial field correlation across northeast India between the tree-ring parameters and gridded scPDSI was significant for the pre-monsoon season (February-May).

On this basis, pre-monsoon drought (scPDSI) was reconstructed for all 95 scPDSI grids covering the entire Northeast India based on 12 total ring width chronologies. The reconstruction covered the past 149 years, from 1872 to 2020 CE. The reconstruction passed the stringent calibration-verification statistics for the majority of the grids (38 grids) lying between the latitudes 22–26 °N, indicating statistical skill in the reconstruction. Spatial field correlation analysis computed between the February-March drought reconstruction and gridded instrumental drought (scPDSI) exhibited good agreement for the same 38 grids. The dry years in the reconstructed pre-monsoon drought concurred with the notable historical monsoon droughts over India in general and the north-eastern region of India in particular.

The present reconstruction also compared favorably with other tree-ring-based drought reconstructions for similar seasons from Nepal and Myanmar. Significant periodicities identified by performing wavelet analysis on the reconstructed drought showed an influence of the Pacific Decadal Oscillation (PDO) and the Atlantic Multi-decadal Oscillation (AMO). However, the relationship was generally weak and temporally unstable.

The reconstruction carried out in this thesis is the first reported tree-ring-based drought reconstruction from the north-eastern region of India. This study also presents the first established network of partial ring width chronologies (earlywood, latewood and adjusted latewood) developed from the conifer Pinus kesiya throughout its native distribution in South and Southeast Asia.

Sreevidya E
Central University of Kerala
Kasaragod.

In order to understand the extent of climatic change and ocean conditions, microfossils preserved in marine sediments are excellent tools. Among the micro-paleontological proxies, pteropods are highly sensitive to dissolution and therefore indicate the changes in ocean chemistry associated with monsoon

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variation. Pteropod shells are made of aragonite, a metastable polymorph of CaCO3, which is more susceptible to dissolution than calcite in seawater. The aragonitic shells of pteropods make them respond immediately to changing ocean water conditions. The study aimed to understand the detailed Late Cenozoic pteropod preservation records from the Indian Ocean to decipher palaeoceanographic and paleoclimatic implications. In this study, we evaluate aragonitic pteropods and the factors that affect the preservation of pteropods to account for the oceanic acidification and shoaling of aragonitic saturation and compensation depth of the Indian Ocean. For that, several sediment cores were analyzed from different parts of the Indian Ocean at different water depths and of varying chronology.

The results from the present study clearly show that increasing CO_2 concentration in the atmosphere has a primary role in preserving pteropods in marine sediments. The carbonate saturation and ocean acidification related to the climatic and oceanographic settings have affected the pteropod preservation in the geological record of the Indian Ocean. The inferences were drawn on the past variability in pteropod diversity/preservation, ACD and OMZ fluctuations, and the role of intermediate and deep-water ventilation. We have also presented the longest extended pteropod variability data spanning the last 1.2 Ma from the Maldives and the Andaman Sea. The study has reported a total of 20 pteropod species (eight genera of three families come under the order Thecosomata). Maximum abundance/ good preservation of pteropods were observed during stadials like the Little Ice Age, Heinrich events 1, 3, 5, and glacial periods MIS 2, 4, 8, 12, and 16 due to a weaker OMZ and thus deeper ACD. Varying depth of ACD is found to be existed in different parts of the Indian Ocean i.e., Equatorial Indian Ocean=>490 m, Laccadive Sea=<1340 m (Persistent OMZ in the northern Arabian Sea: high productivity & shallow winter mixing), North of Narcondam= <1120 m, Barren Island= < 720 m, Middle Andaman= ~720-1340 m and Southern Andaman=<1200 m. the study also brings out the existence of adequate ventilation of deep water during the glacial time, enhanced winter monsoon, reduced primary productivity, weakened OMZ and deepened ACD.

However, the pteropod occurrence and preservation differ spatially according to the local environment and physiography of the study site. This variability can be attributed to the monsoonal activity and the associated changes in salinity, temperature, sedimentation rate, seawater chemistry, overall productivity, decomposition of organic matter, volcanogenic inputs,etc., in the Indian Ocean. Results demonstrate that the surface water carbonate chemistry severely affected the ability to calcify and maintain shells of late Pleistocene pteropods. These findings are significant in the present scenario of increased dissolution of aragonite pteropod shells owing to the anthropogenic input of CO_2.

For further reading:

Sreevidya, E., Sijinkumar, A.V., Nath, B.N., Ammoose, K.J., Kurian, P.J., Pankaj, K., Sreelakshmi, M.M., Shravan, S. 2023. A~ 50 kyr record of carbonate (pteropods) preservation from the Laccadive Sea, Northern Indian Ocean. Marine Geology, 106958.

Sreevidya, E., Sijinkumar, A.V., Nath, B.N. 2021. Palaeoceanographic significance of aragonitic pteropods in the Indian Ocean - A review. Boreas 50, 12540.

Sreevidya, E., Sijinkumar, A.V. and Nath, B.N. 2019. Aragonite pteropod abundance and preservation records from the Maldives, equatorial Indian Ocean: Inferences on past oceanic carbonate saturation and dissolution events. Palaeogeography, Palaeoclimatology, Palaeoecology, 534, 109313.

Rikee Dey
Birbal Sahni Institute of Palaeosciences, Lucknow

Thesis Title: Reconstruction of Miocene to Pleistocene palaeoclimate derived from the studies of silicified & calcified microfossils from Andaman & Nicobar Islands

Supervisors: Dr Amit K Ghosh (BSIP, Lucknow) and Prof Ajoy K Bhaumik, IIT-ISM) Dhanbad, Jharkhand.

The studies on palaeoclimate, specifically from the Neogene and Quaternary sediments of the Andaman-Nicobar Basin, are important to understand past climatic change that may be useful to decipher future climate scenarios. In this backdrop,

the research work is focused on the studies of silicified and calcified microfossils, viz., radiolarians, benthic and planktonic foraminifera and benthic calcareous algae from the Miocene to Pleistocene sediments to develop a high-resolution multiple microfossil biochronology. A synergistic approach was employed based on the evidence of microfossils coupled with the geochemical signatures for accurate interpretation of palaeoecology, palaeoclimate, depositional environment and overall palaeoceanography that may be useful as a benchmark to predict future climatic changes. An in-depth study on the bioevents based on radiolarians has been carried out at three outcrops on Havelock Island, one outcrop on Neil Island, and one outcrop on Car Nicobar Island. For the first time, occurrences of a number of species have been recorded in the northeast Indian Ocean. Diversity analysis and Water Depth Ecology (WADE) studies of the radiolarians were performed for a better understanding of the palaeoecological perspectives. A comparison of the dataset obtained from the diversity analysis and the Water Depth Ecology (WADE) index provides a clear picture of the environment during the middle Miocene to early Pliocene.

Based on the study on planktonic foraminifera from the Pliocene - Pleistocene sequence the Plio–Pleistocene boundary has been demarcated. Stratigraphically, Constrained Numerical Cluster (i.e., CONISS) analysis was performed to identify the biozones. An event of ocean upwelling has been identified based on the index planktonic foraminiferal taxa from the late Pliocene to early Pleistocene of the northern Indian Ocean that also correlates with the palaeoceanographic records known from other upwelling regions of the world. Studies on rhodolith forming coralline red algae and benthic foraminifera were carried out on the Serravallian (late middle Miocene) sediments and focused on analyzing different biofacies based on the rhodolith-forming coralline red algae and benthic foraminifers. This is the first comprehensive record of rhodoliths from the Serravillian of the tropical northeast Indian Ocean.

The study envisages that the carbonate production flourished during the Serravillian of tropical northeast Indian Ocean. Isotopic analyses (both carbonate and oxygen) have been taken into consideration in bulk rock and imbedded foraminifers (both planktonic and benthic) from the Serrvallian of Little Andaman Island. Based on the study of the Miocene to Pleistocene sequences of the Andaman-Nicobar Basin, the age of the sediments has been determined, and significant climatic events have been identified.

Salman Khan
Birbal Sahni Institute of Palaeosciences
Lucknow

Thesis Title: Pliocene-Pleistocene changes in Vegetation, Climate & Sedimentation in Middle & High Latitudes.

Supervisors: Dr Anjum Farooqui (BSIP, Lucknow) and Prof. Uma Kant Shukla (Geology Department, BHU).

The circumpolar distribution of vegetation in equilibrium with climate has been studied from different sites in the Arctic region over the past decades. However, scant data masks the precise time period for the expansion of sea-ice cover. The Pliocene epoch (5.33-2.59 Ma) is characterized by similar atmospheric CO2 and temperature as recorded in modern times, with predictions of enhanced global warming in the future. This study provides a high-resolution (~10 kiloyears, ka) palynological dataset for the late Pliocene interval of the ODP Hole 910C site in the Yermak Plateau, Arctic Ocean. Several intermittent warm and cold intervals were also recorded during the late Pliocene, which gradually culminated in the first glacial epoch of the Quaternary period. However, evidence of Impatiens-type plant taxa suggests frost-free conditions until 2.6 Ma. Based on the palynological assemblages, during warm phases, the MAT ranged between ~4-20°C and during cooler events, it ranged between 0-12°C. The estimated MAP was ~200 mm during cooler events but reached ~900 mm during warmer events. The variation among plant communities allowed us to estimate the significant climatic cyclicity of 23 ka and 41 ka during 780 ka between ~3.4 and 2.6 Ma through spectral and cross-spectral analysis.

This study provides variability in sedimentation suggestive of changes in the influx through Atlantic Water (AW) induced by tectonic changes and external forcing. This study reconstructs sediment dynamics through End Member Analysis of granulometry and clay mineralogy. A higher percentage of clayey silt and sandy silt during the M2 glacial event suggested a lower supply of AW. Active circulation of AW is represented by

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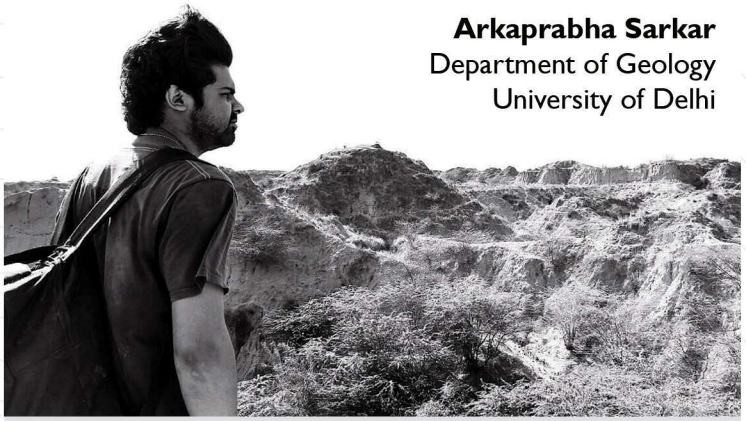
sortable silt (10-63 um) during (m PWP) 3.25-3.01 Ma. The increasing sandy silt distribution shows the increase in glacial debris suggesting a potential provenance change after 3 Ma. Potentially provenance are the Svalbard mainland, Kara Sea, sub-Aerially exposed Barents Sea and Scandinavian countries.

Climate and vegetation revealing palynological proxy datasets were poorly recorded on the Indian subcontinent during the Plio-Pleistocene epoch. This study provides early Pleistocene vegetation with a diverse flora of ~80 plant taxa from recovered palynoflora. The Ningle Nallah sediments of Lower Karewas were deposited between 2.4-2.1 Ma in the Kashmir valley, revealing two broadly distinct phases of biotic assemblages in response to climate and tectonically driven ecological adjustments. Sub-tropical rainforest, temperate broad-leaf pollen taxa, and low conifers suggest MAT and MAP of 17°C and 1000 mm, respectively, during Unit I (~2.4 Ma). The absence of sub-tropical pollen taxa and low terrestrial pollen/spore indicate shallowing of the lake in Unit II (~2.1 Ma) indicating tectonic adjustments. The tectonic uplift of the Pir-Panjal Mountain ranges increased the altitude, obstructing the monsoonal wind and affecting MAT and MAP in the region, which shifted from 17 to 8 °C and 1000 to 760 mm, respectively. Thus, climate change studied in the Yermak plateau and Ningle Nallah section during the Pliocene–Pleistocene Epoch is attributed to both internal tectonic changes and external solar forcing.



Arkaprabha Sarkar
Department of Geology
University of Delhi

Supervisor: Prof. Vimal Singh

Thesis Title: Sediment Dynamics within the Critical Zone of Pranmati Catchment, NW Himalaya

In 2001, the National Research Council (NRC) of the United States of America defined the 'Critical Zone' as the "…the heterogeneous, near-surface environment in which complex interactions involving rock, soil, water, air and living organisms regulate the natural habitat and determine the availability of life-sustaining resources." In simpler words, the term refers to the thin outer skin of the planet, extending from the top of the vegetation canopy till the base of circulating groundwater. Although it occupies a miniscule fraction of the planet, it plays a significant role in the sustenance of life. It is within this zone that the lithosphere, atmosphere, hydrosphere and biosphere interact with each other in a complex web of feedback processes. The Critical Zone system has two major components: (1) water, which travels through all the spheres connecting them through a facilitating exchange of material and energy (much like the circulatory system of the Human body!), and (2) soil, that provides and interface for the various spheres to come and interact. I chose to investigate the geological surface processes involved with soil —the nucleus of the Critical Zone. I chose to work in the Pranmati catchment, a small mountainous river catchment located in the heart of the Himalayas. Pranmati is a small 4th order tributary of the River Pindar, which is part of the Ganga system. The 93 km2 catchment area comes under the Chamoli district in Central Uttarakhand.

If you randomly pick up a sediment particle from the channel bed of a stream, it will have a story to tell — story unique of its own, yet similar to many. I patiently decided to listen to it, document it, and narrate it to the scientific fraternity. If we take a walk up along a hillslope transect and reach the divergent ridge zone, we will be

standing at the spawn of these sediment particles. The bedrock beneath our feet weathers to form mobile soil. My first objective was to determine the rate of production of soil from the bedrock using terrestrial 10Be. 10Be is a cosmogenic radionuclide (CRN) that forms exclusively due to the interaction of cosmic particles with the atmospheric and/or terrestrial elements. It has been shown by previous workers that the rate of soil production from bedrock depends on the topographic curvature and the thickness of the overlying soil mantle. Using the empirical relationship between the parameters, I modelled the soil production rates and soil depth at the divergent surfaces within the catchment.

Now, once a particle is dislodged from the parent rock, it becomes mobile. In fact, these hilly landscapes are continuously moving at various rates. Much like the statement of the Greek philosopher Heraclytus, 'you can't step on the same system twice' in the mountains. A few questions that pop up at this point are, is the system moving uniformly at a steady rate or is there variability?; if the rates vary, what are the factors controlling the rate of movement? To answer these questions, I needed a fallout nuclide—one that can be used as a tracer to study soil erosion and redistribution over longer time periods. The ideal and easiest option was the meteoric 10Be. Unlike its terrestrial cousin, it forms in the atmosphere at high rates, reaches the surface by wet and dry fallout, adheres to the surface of soil particles, and gets redistributed with the soil. Thus, enrichment and depletion of this fallout nuclide indicate the accumulation and erosion of soil. Estimating the fallout rates using the global circulation models of previous workers, the rates of erosion were calculated and related to topography and land cover properties.

The product of the denudation of a catchment ultimately reaches the catchment. Thus, the sediment sitting at the mouth of the catchment can indicate the denudation history of the catchment as a single unit. I used a popular technique for estimating spatially averaged long term denudation rates of catchments employing terrestrial 10Be. The technique has been used to estimate denudation rates of catchments (mostly large ones) across the world, including Himalayan catchments such as the Ganga, Yamuna, Satluj, Brahmaputra, etc. However, it has never been reported at what rate the smaller catchments deplete. I investigated the denudation process in small catchments, the factors controlling the denudation in smaller catchments, the difference in the processes operating in larger systems with those in smaller systems, and the role of landslides in the denudation of small systems.

It has been demonstrated using numerous ways by previous workers that all the sediment produced in the catchment does not leave the catchment over shorter temporal scales of observation, nor does all the sediment produced on the hillslope manage to reach the channel network. Some of the sediment reaches the sink, while most of it remains locked in the hillslopes until some threshold phenomenon occurs. The results of the previous objective indicated that a large volume of sediment gets arrested within the system. This raises the question, which all areas within the hillslopes are supplying sediment and which all areas are storing the sediment under steady state condition. For this, we assessed the sediment connectivity within the hillslopes. Well connected areas are zones that have higher probabilities of sediment contribution. I further formulated a storage potential index (SPI) that gave the potential of a point of the hillslope to store sediment. The index was used to accurately identify geomorphic units that can act as potential storage zones.

All the processes studied till now operate under steady state conditions. Similar to any other natural system, steady state conditions are deranged by high magnitude stochastic events. These events may be of varying magnitudes and occur at varied frequencies. The effect of one such stochastic event was studied when a flash flood hit the catchment area. The event lasted for 6-8 hours and heavily modified the morphology of the channel. It was observed that the event had originated from a particular sub-catchment and propagated downstream along the trunk channel, while no other sub-catchment showed any significant response to the event. Upon analyzing the event, it was deduced that the particular source sub-catchment had an inherent property to generate surface runoff. Also, this particular sub-catchment has huge volumes of stored sediment, thus, the perfect recipe for a flash flood.

The study brought forward a couple of important points. The bedrock in the catchment is converting to soil at a mean rate of 12 mm/kyr. This conversion takes place in divergent areas, from where it moves into the adjacent convergent areas at a gross mean rate of 21 mm/kyr. This erosion is strongly controlled by topography and land cover properties. The processes are simpler in the hilltop region and more complicated in the downslope region. Catchments are denuding at a mean rate of 10 mm/kyr, much slower compared to the large Ganga catchment, indicating that large volumes of sediment are getting arrested within the system. Also, denudation in these smaller catchments is relatively independent of the regional tectonics, but tectonics does have a control in larger catchments. Specific geomorphic units, such as junctions of land cover units, mid-slope regions, grassland pockets, and landslide debris cones, act as storage zones.

These storage zones tend to grow in an upslope direction, feeding on a positive feedback mechanism. During high magnitude stochastic events, these stored sediments are evacuated. The degree and extent of evacuation are functions of the threshold resilience of the storage zones. Once evacuated, the storage zone starts accumulating sediment until the next threshold event.

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Amritpal Singh Chaddha
BSIP, Lucknow

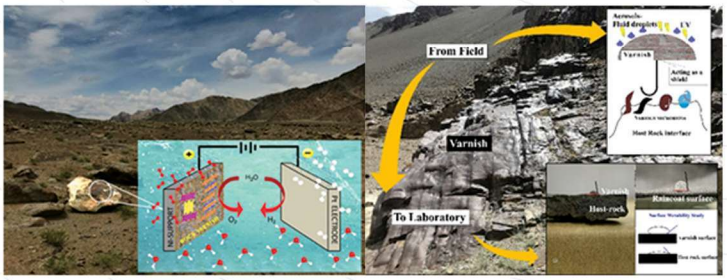
Thesis Title: Geochemical Characterization of the Rock Varnish & its Application to Electrochemical Devices

Supervisors: Dr. Anupam Sharma, BSIP, Lucknow, and Dr. N.K. Singh, Department of Chemistry, University of Lucknow.

Dark, black-coloured coatings found on various rocks across arid and semi-arid regions around the world have always been a keen center for research. These thin coatings are termed Rock/Desert Varnishes. Dark veneers are commonly composed of Fe and Mn oxides and hydroxides, accompanied by clay minerals, salicaceous materials, and certain trace elements. The most characteristic elements are iron and manganese; therefore, these materials are also commonly known as ferromanganese rock coatings. These materials accumulate on rock surfaces over time via different environmental and chemical processes. These enigmatic coatings have attracted researchers to understand the formation mechanisms of rock varnish layers, study their extreme properties, and estimate climatic changes and occurrences of natural events dating back several thousand years. The origin pathway (biotic or abiotic) of rock varnish is debatable. It is of utmost importance to identify a mechanism for the formation of these dark coatings for various researchers in order to better report physiological and biological factors influencing paleoclimatic research, environmental changes around the globe, and report the prime importance of manganese (a major elemental constituent of rock varnishes across varied arid regions) and its role in rock varnish formation and biogeochemical cycles.

The study discussed in this research work is the first attempt to chemically characterize the rock varnish in an Indian context and to understand the mineral-microbe interactions, especially in the high-altitude, cold arid regions of Ladakh, NW India, utilizing diverse analytical techniques to address the important questions about its formation, as these naturally occurring coatings have not received much attention. The entire study was effectively separated into two sections: the first section dealt with the long-running controversy over whether rock varnish originated from biotic or abiotic processes, and the second section focused on the electrochemical uses of the rock varnish. Additionally, the current work established the use of rock varnish in electrochemical applications, which has larger implications for meeting current demands, but has not previously been reported. Several theories have been proposed to explain how rock varnish is produced, but none have been widely accepted. Understanding the processes (biotic and abiotic) involved in the production of rock varnish is the primary objective of geochemistry and other related aspects of rock varnish characterization. Numerous analytical methods have been used to accomplish this, including petrography, FESEM-EDS, XRD, Raman spectroscopy, contact angle analysis, XPS, ED-XRF, WD-XRF, ICP-MS, GC-MS/MS, IR spectroscopy, magnetic mineralogy, IR-MS, and metagenomic analyses. A comparative analysis of the distribution of elements in the host rock (surface above which the varnish is present) and varnish suggests the presence of elements such as Mn, Fe, Si, O, Mg, Na, P, and K. Mn and Fe concentrations were found to be relatively higher in the varnish layer, suggesting a prominent role for these two elements in varnish layer formation. Combining the above observations, we can say that Mn and Fe play an important role in shielding the inner material from high temperatures, UV radiation, and adverse climatic conditions. Compared to previous metagenome results from Cima varnish, Nevada, USA, the metagenomes of these locales were entirely different from our Ladakh varnish samples. This demonstrates how the microbiota in the varnish layer is location-specific and is affected by physical traits, including moisture, temperature, UV flux, and altitudinal orientation. These mineralogical analyses also helped to detect the presence of manganese dioxide (MnO_2) in the form of birnessite (a naturally occurring mineral), which in turn provoked the turning of our research towards its electrochemical behaviour, as MnO_2 is a very promising electroactive substance. The natural rock varnish material's composition of semiconducting Fe and Mn has advanced its use in electrochemical applications. We successfully demonstrated for the first time that rock varnish can be used as a novel electrocatalyst for water electrocatalysis and methanol oxidation processes. This work paves the way for future research on rock varnish because it offers a comprehensive analysis of varnish qualities.

In summary, rock varnishes are outer coatings found on desert rocks that may act as a record of ancient environmental processes. This research combined analytical, electrochemical, and genomic techniques to study the chemical composition of these varnishes and to understand the mechanism by which they form. This provides an exciting opportunity to study the history of the environments in which the rocks are found, opening new insights into the natural systems that have shaped the global climate.



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Vikash Kumar
National Centre for Polar and Ocean Research, Goa

Thesis Title: Teleconnection between Past High and Mid-Latitude Climate and Indian Monsoon Variability

Supervisor: Dr. Manish Tiwari, Scientist-F and Head (Past Climate and Ocean Studies), National Centre for Polar & Ocean Research (Ministry of Earth Sciences), Goa

As humans, we tend to view the world in compartments, separated by languages, cultures, and climates. However, our planet is a complex and interconnected system, with different subsystems operating under a delicate balance. This is especially true regarding the planet's climate system, which not only varies over a wide range of timescales but is also linked across different regions. Large-scale atmospheric and oceanic circulation patterns connect various subsystems across the globe, making climate variability over different regions inextricably linked to one another. This is well evidenced by the coherence seen in paleo-records from distant regions of the world, indicating climatic teleconnections that operate naturally within our planet. The Arctic and the Southern Ocean are highly coupled components of the global climate system and are known for their excessive sensitivity to climate change. However, their impact extends beyond their immediate regions and can significantly affect low-latitude climate systems, such as the tropical monsoon flow over the Indian subcontinent. This thesis consists of paleoclimate reconstruction in the Arctic and the Southern Oceans and investigates their impact on the Indian summer monsoon on select time scales.

In the Southern Ocean, a sediment core from the subtropical front region in the Indian sector was used to reconstruct quantitative climate change during the last glacial period. Employing Mg/Ca-paleothermometry, this study presents the first high-resolution record of surface temperature variations in the Indian Sector of the Southern Ocean (ISSO) on a multi-centennial timescale, spanning the period from 39.09 to 3.4 kyr BP. Through the use of reconstructed temperature data and model simulations, the study suggests a persistent teleconnection between millennial-scale variations in Indian monsoon rainfall and surface temperature conditions in the ISSO region.

In the Arctic region, sedimentary biogeochemical parameters were investigated as climate proxies using surface and short core sediments from a western Svalbard fjord-Kongsfjorden. Strong glacial-marine contrast at the fjord was reflected as steep biogeochemical gradients in parameters measured in surface sediments (TOC, TN, δ13C, and δ 15N). Changes to these gradients under climatic stress were recorded as temporal signals in core sediment proxies, establishing the climate sensitivity of the proxies while providing an interpretive framework for high-resolution paleoenvironmental studies on more extended time frames.

Next, a sediment core covering a more extended time frame (last millennium) was investigated, covering a period between AD 1106 and AD 1967. Using an unsupervised learning technique, the multivariate core data was partitioned into two groups, helping us identify occurrences of warm and cold Arctic spells at multi-decadal resolution during the last millennium. Individually, the δ15N variability formed a highly coherent pattern with surface temperature records, while δ13C and elemental OM concentrations revealed changing mixing proportions between marine and terrestrial sources. Furthermore, the region's interchanging warm and cold episodes, as detected by the multivariate sedimentary record, were linked to stronger and weaker summer monsoons over India, respectively. Modulation of meridional thermal gradients over the Indian monsoon domain amid contrasting climatic conditions in the Arctic region likely facilitated the observed Arctic-Indian monsoon teleconnection during the last millennium.

Padmasini Behera
National Centre for Polar and Ocean Research, Goa

Thesis Title:
Teleconnection between Northern Polar Climate and South Asian Monsoon During Mid Pliocene Warm Period and since Late Quaternary.

Supervisor: Dr. Manish Tiwari, Scientist-F & Head (Past Climate & Ocean Studies), National Centre for Polar & Ocean Research, Goa

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The current global warming causes significant changes in the high latitude climate, including an unprecedented reduction of sea ice extent (SIE) in the Arctic. As per the latest IPCC report, the South Asian Monsoon (SoAM) precipitation is also projected to increase, primarily because of the atmosphere's enhanced moisture-carrying capacity. A few short time series-based studies have proposed a link between the Arctic SIE and the monsoon precipitation; a reduction of the Arctic SIE is linked to the extreme precipitation events in central India. But such studies span only a few decades and hence are uncertain. We must study past periods with similar warmth and greenhouse gas concentrations to fully understand the connection between these far-off regions in the current global warming scenario. The Late Pliocene, including the Mid Pliocene Warm Period (MPWP; around 3 Ma, million years ago), is considered the nearest analogue to the modern climate with a similar CO_2 concentration. Likewise, another critical period of warmth was the last interglacial (Marine Isotope Stage 5e, ~125 kyr BP, thousand years before present). Previous paleoclimatic studies on teleconnection between northern high latitude climate and the SoAM variability mainly cover the last glacial period (from 40 to 60 kyr BP). The present study goes beyond this and focuses on the teleconnection between these two regions during the MPWP (~ 3 Ma), the last interglacial (~ 125 kyr BP), and the Holocene (last ~11.7 kyr).

The present thesis is based on three sediment cores from three sites viz., eastern Arabian Sea (IODP Expedition 355), the Arctic Ocean (Fram Strait, ODP Hole 910C), and the Norwegian Sea (AMK-5188). We use multiple isotopic and geochemical proxies to reconstruct the past climate variability of those regions. In the Arctic Ocean and the Arabian Sea, the sediment cores were analyzed for the isotopic and elemental concentration of the sedimentary organic matter (SOM). All the analysis and measurements were carried out in the facilities available at NCPOR, Goa. The total organic carbon (TOC), total nitrogen (TN) and isotopic ratios (δ13C and δ15N) of SOM were analyzed using the Elemental Analyzer-Isotope Ratio Mass Spectrometer (EA IRMS). In the Norwegian Sea, the sediment samples collected from the Lofoten Basin were analyzed for the trace element ratio (Mg/Ca), δ18O and δ13C to reconstruct surface temperature and salinity variability and bottom water circulation. Trace element analysis of these samples were performed using ICP-OES.

In the Arctic Ocean, sediment from the ODP Hole 910C from the Fram Strait (Atlantic–Arctic Gateway) is used to reconstruct the water column stratification during the late Pliocene, including MPWP. The sea ice variability in the Arctic is studied by a few workers during this period, however, little is known about the Arctic stratification, which is one of the major controlling factors for the sea ice melt. In this study, the Arctic stratification is reconstructed based on the surface relative nutrient utilization. It shows that the Arctic stratification is stronger during the warmer intervals of the MPWP and weaker during the colder or glacial periods. The enhanced stratification during these warm intervals could be due to the enhancement of the warm North Atlantic Current in the Arctic and the orbitally induced solar insolation, which increased the sea ice melt and river influx. The stronger stratification stores more heat and accelerates sea ice melting.

The South Asian Monsoon variability was studied during the late Pliocene period using sediment from Site U1456 (IODP Expedition 355) from the eastern Arabian Sea. The high-resolution record of SoAM variability during the late Pliocene was reconstructed using surface productivity, denitrification, weathering, and terrestrial influx proxies. We found two distinct intervals of monsoon intensification - during MPWP and at 2.9 Ma. The monsoon variability results from an interplay between thermodynamic and dynamic effects. The SoAM variability is further compared with the recently reconstructed sea ice extent in the Arctic during the late Pliocene. We find that lower (higher) Arctic SIE leads to stronger (weaker) SoAM during the late Pliocene via asymmetric interhemispheric energy export and modulating jet stream flow and meridional circulation.

In the Norwegian Sea, the sediment from the Lofoten Basin is analyzed to quantify the climate change during the last interglacial and the Holocene. We find that during the last interglacial, the early warm (~6°C) and saline phase was disrupted by a cold event at around 124 kyr, which is marked by the reduction of surface temperature (~3°C), surface salinity, and bottom water ventilation. Similarly, during the early Holocene, the decrease in temperature (< 2°C), salinity, and bottom water ventilation represent a major cooling event at ~8.6 kyr BP, and then it attains its thermal maxima at around 8 kyr BP and lasts up to 4 kyr BP. It suggests that a large influx of fresh water to the core site could have reduced the heat transport to the high latitude by declining the thermohaline circulation, and that reduced the heat to the northern high latitude and led to colder events.

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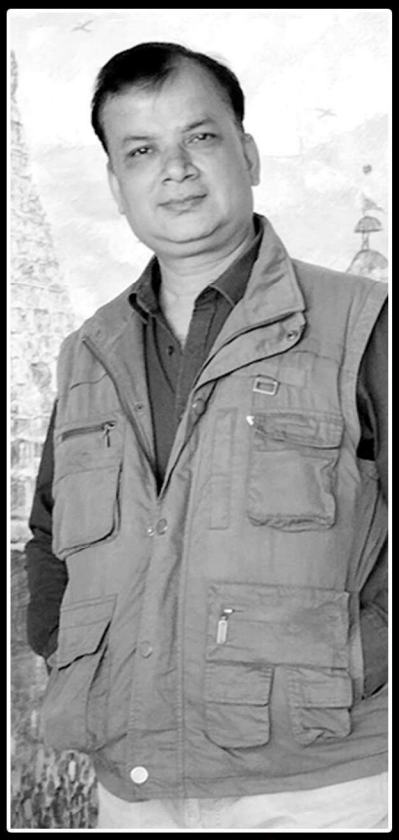
With great sorrow and bittersweet gratitude, we bid farewell to our kind, brave, caring and unimaginably generous colleague...

Dr. Rajesh Agnihotri

(June 06, 1972 – January 17, 2023)



Dr. Agnihotri was a novel scientist, researcher, educator, and proponent of science who untimely passed away on Tuesday, January 17th , 2023. Born and brought up in the small town of town Sitapur in Uttar Pradesh, he was the last child of his parents, (the Late. Mr. Rajendra Dutt Agnihotri and Late Mrs. Indira Agnihotri). He received his schooling at the Government Inter-College in Sitapur to begin his early career. He received master's degree (M.Sc.) in Chemistry from Lucknow University in 1994. Later, for his doctoral studies, he moved to the Physical Research Laboratory (PRL), Ahmedabad. Having worked with Geochemistry giants like Prof S Krishnaswami and Prof. B L K Somayajulu for his Doctoral research (2002) at Physical Research Laboratory, Ahmedabad, he spent his entire life looking for innovative approaches to Earth system studies from the continental, atmospheric, and oceanic spheres. In continuation of this research career, he has done postdoctoral research at the Max Planck Institute for Chemistry at Mainz, Germany (2022-2004) and the University of Massachusetts, Dartmouth (2004-2006). Later, he served at the National Oceanographic Institution (NIO), Goa, between 2006-2010 following which he moved to the National Physical Laboratory (NPL), New Delhi, from 2010-2015 before joining the Birbal Sahni Institute of Palaeobotany (now the Birbal Sahni Institute of Palaeosciences), BSIP, Lucknow, as Scientist-E until his demise. In his research career, Dr. Agnihotri has successfully illustrated the utilization of stable isotopic and geochemical tracers in repositories of the land, ocean, and atmosphere to get insights into complex expressions of climate change. Some of his works from the Arabian Sea and Peru margin received significant global attention by the scientific community. Subsequently, he also received recognitions in the field of atmospheric science, environmental sciences and in geoarchaeology. He extensively utilized the Carbon, Nitrogen and Sulfur isotopes as environmental tracers in diverse fields with innovative approaches. For facility and capacity building, Dr. Agnihotri's contribution to establishing Isotope Ratio Mass Spectrometry (IRMS) labs at NPL and BSIP is highly significant. These labs have not only successfully run till date but are also known for producing high end data quality, and their scientific contributions are well received by the scientific community at national and international level.

At BSIP, Dr. Agnihotri established protocols for making graphite from a variety of materials that can be directly used for 14C measurements using Accelerator Mass Spectrometry (AMS) anywhere. He also upgraded the existing National Radiocarbon Dating Laboratory established in 1974 into a radiochronology and isotopic characterisation. In recent years, Dr. Agnihotri has adopted cutting-edge research tools/methods in the field of archaeology for chronometric studies and geochemical fingerprinting. For example, he contributed significantly to archaeological site explorations/investigations at Vadnagar, Sinauli, Vidarbha, and Kunal that showed a broader perspective of Indian archaeology. Additionally, he improved the Indian setup by developing innovative methods for archaeological materials, such as zoological (bones and teeth from human and animal remains) and botanical (charred agricultural grains, pot soils, organic leftovers, etc.) resources for chronological understanding and scientific explanations. He made a substantial contribution to the preservation of the diverse and rich Indian prehistoric legacy on archaeological sites such as Vadnagar, Sinauli, Vidarbha. His intuitive mind showed him the way to better grasp the reality of human civilization on the Indian subcontinent and traditional Indian scientific knowledge that has been dormant for thousands of years, the focus of his most recent research is on gaining fresher insights from Indian archaeological excavations.

In a nutshell, Dr. Agnihotri's contributions touched the entire spectrum of geochemical and isotopic spheres. To his credit he has published in more than 60 journals with a distinguished national and international scientific reputation. His tremendous contributions to radioactive and stable isotope research in India have been honored on a number of forums. He received the prestigious National Geosciences Award (2013) from the Ministry of Mines of the Indian government. For his remarkable contributions to the Earth and Environmental sciences, the Indian Geophysical Union in Hyderabad, India, awarded him the M.S. Krishnan Gold Medal in 2012. He was not only untiring in raising questions but also well versed in recent scientific activities and ground-breaking results in his research field. He behaved as a fearless thinker and remained a tough individualist throughout his entire career. Many people he touched will miss him and remember how kind and caring he was. We will always love and miss him.

The AOQR and Radiocarbon Dating Laboratory families will always remember his immense contributions and landmark outcomes in developing the radiocarbon facility, and understanding of the chronology of Indian archaeology and several other Quaternary disciplines.

Contributed by-Sanjay Gahlaud, Anand Rajoriya, Niteshkumar N Khonde, and Biswajeet Thakur, BSIP, Lucknow.

ASSOCIATION OF QUATERNARY RESEARCHERS

Quaternary Chronicles

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Annual General Body Meeting of the Association of Quaternary Researchers (AOQR)

&

3rd Conference on Geology: Emerging Methods and Applications (GEM-2023)

23-25 January 2023

The Annual General Body Meeting of the Association of Quaternary Researchers (AOQR) was held on Tuesday, January 24, 2023, in the Natural History Museum, Department of Geology and Environmental Science at Christ College Autonomous, Thrissur, Kerala (off-line) as well as virtually (online). The meeting was held along with the 3rd conference on Geology: Emerging Methods and Applications (GEM-2023) during 23-25 January 2023 funded by the Ministry of Earth Sciences, Govt. of India, National Centre for Earth Science Studies (NCESS), Kerala State Disaster Management Authority (KSDMA) and Kerala State Council for Science, Technology and Environment (KSCSTE), Govt. of Kerala. The conference included a session on Quaternary Geology and Geoarchaeology on 24th January 2023 and was attended by members of AOQR, who presented their research findings. The conference was inaugurated by Prof. Dr. Kuruvilla Joseph, Outstanding professor and Dean of, the Indian Institute of Space Science and Technology (IIST), Thiruvananthapuram. Dr. V.V. Sesha Sai, Director, Geological Survey of India, State Unit Maharashtra Central Region, Nagpur delivered a keynote address. The conference attracted over 150 participants including 78 presentations from over 37 institutions across India and a number of speakers from abroad.

Out of these, there were 24 invited lectures given by senior researchers in varying capacities as senior professors/ scientists, etc. on various aspects of earth science. The conference also attracted many students at research and master's levels with 42 oral presentations and 12 poster presentations with a unique objective of bridging the gap in research and education between the leading National and International Institutions with State Universities and Colleges. The conference discussed various topics in Earth Science, including Petrology, Geochronology and Isotope Geochemistry, AI and ML in Earth Science, Quaternary Geology and Geoarchaeology, Climate and Sea Level Changes, Environmental Geology, Geo hazard Mitigation and Management, Remote sensing and GIS in Earth and Planetary Science and Hydrology and Water Management.

The session on Quaternary Geology, Climate, and Sea-level changes attracted several invited sessions and student presentations. Prof. Hema Achyuthan, Anna University, Chennai, Dr. Binita Phartiyal, Birbal Sahni Institute of Palaeosciences, Lucknow, Dr. Shaik Mohammad HUSSAIN, University of Madras, Chennai, Dr. Rakesh Chandra, University of Ladakh, Leh, Dr. Sijinkumar, A.V., Central University of Kerala, Kasaragod, Dr. Anoop Ambili, Indian Institute of Science Education and Research, Mohali, Dr. Prabhin Sukumaran, Charotar University of Science and Technology, Gujarat and Dr. M. Suresh Gandhi, Univerisity of Madras, Chennai had given invited talks on various aspects of Quaternary Geology and Environmental processes. The session on Quaternary Geology and Geoarchaeology was started with an invited talk by Dr. Hema Achyuthan on "Paleolimnology of southern Peninsular Lakes and Holocene paleoenvironmental shifts and followed by a talk by Dr. Binita Phartiyal, who discussed her research on Landscape evolution and climatic variations in Ladakh, NW Trans-Himalaya during Late Quaternary. Dr. Shaik Mohammad HUSSAIN presented on "Distribution of Ostracoda and their statistical aspects: Implications on (paleo) environment and high energy marine events and sediments and Dr. Sijinkumar, A.V presented the results of his research on 'The fate of aragonitic pteropods in the Indian Ocean under ocean acidification scenario'. Dr. Rakesh Chandra presented his research on Micromorphology and Geochemistry of Kashmir Loess Palaeosols in the Quaternary sediments of Karewa of Kashmir Valley; Implications for weathering history and palaeoclimate reconstruction. Dr. Prabhin Sukumaran discussed his findings on 'Carbon isotope analysis of a

Late Quaternary fluvial, aeolian and paleosol sedimentary sequence from the Central Tapi River Valley. Dr. Hector A. Orengo, Catalana Institute of Classical Archaeology presented his research on "Big multitemporal geospatial data and the large-scale analysis of South Asia's past landscapes." Dr. Anoop Ambili had given an invited talk on "Molecular markers for natural and anthropogenic impact in aquatic ecosystems and Dr. M. Suresh Gandhi presented the results of his research on "Micropaleontology, geochemistry, and its environmental significance at Yedayanthitu Kaliveli estuary, Tamilnadu.

The sessions also attracted a number of student presentations on various aspects, including; Reconstruction of surface and subsurface hydrography variation records from the Bay of Bengal Sediments, Benthic foraminiferal productivity and Total Organic Carbon (TOC) records from the East Equatorial Pacific Ocean, Late Holocene Paleoclimatic Record using a Sedimentary Sequence, Microbial profiling of ancient sediment: Challenges and Opportunities in methodologies of extracting metagenomic DNA, Indian Summer Monsoon variability in the past 15,000 years using planktonic foraminiferal data, Provenance of the sand dunes of Thar Desert, western India, Geoarchaeological exploration of Quaternary landscape and Middle Palaeolithic Activity Areas in North Karanpura Valley, Jharkhand, etc. The conference was concluded on 25th January 2023 and Dr. Daniel J. Dunkley, Department of Polar and Marine Research, Polish Academy of Sciences, Poland was the chief guest in the valedictory session.

The Annual General Body Meeting of the Association of Quaternary Researchers (AOQR) was held on Tuesday, January 24, 2023, at 05:00 PM.

The Vice-President of AOQR, Dr. Pradeep Srivastava presided over the meeting and welcomed the gathering. Dr. Binita Phartiyal, Secretary of AOQR presented the annual report of the activities held during the year 2022-23. The members reflected on their memories and paid homage to Prof. S N Rajguru, an Honorary member of AOQR and an icon of Indian Quaternary Science. The members also shared words of reminiscence and paid tribute to Prof. K S Valdiya, Prof. I B Singh, and Dr. Rajesh Agnihotri remembering their unparallel contributions to the Quaternary sciences of India. Dr. Anoop Ambili, ISSER Mohali had made a bid for organizing the Indian Quaternary Congress (IQC) 2024 at the IISER, Mohali and the members unanimously agreed and supported it. The meeting was concluded by 6:30 pm with a vote of thanks to the Chair and all members. AOQR's office bearers and members thanked Dr. Linto Alappat, Department of Geology and Environmental Science, Christ College Autonomous, Kerala, and his team for making all arrangements for hosting the AOQR AGM 2023.

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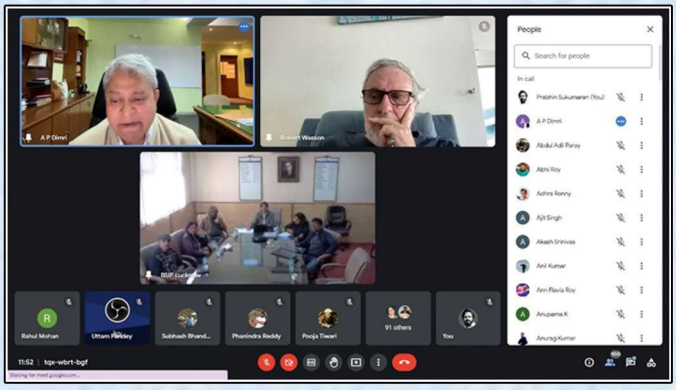
ASSOCIATION OF QUATERNARY RESEARCHERS

3rd Foundation Day Function of Association of Quaternary Researchers (AOQR)

December 12, 2022

The Association of Quaternary Researchers (AOQR) celebrated its third foundation day on December 12, 2022.. The program commenced at 11 a.m. with a welcome address by the President of AOQR, Dr.Vandana Prasad. She explained how the association stands out with a vision and value of a new kind.The Vice President of AOQR, Dr. Pradeep Srivastava, introduced the activities AOQR. He briefed on the association's wide range of activities, that was conducted both online and offline, in such a short period of time.The first Foundation Day Lecture was given by Prof.A. P. Dimri, Director IIG, Mumbai, on "Monsoon with Changing Time." In this lecture, he talked about the basic concepts and evolution of the monsoon throughout geological history. Dr. Doris Barboni, Department of Ecology, French Institute of Pondicherry, delivered the second Foundation Day Lecture on "Characteristics of Early Hominin Habitats: Data from Micro-Plant Remains and Niche Modeling" on the following day. More than a hundred people from various institutes across India attended the event. Dr. Binita Phartiyal, Secretary, AOQR, concluded the program with words of gratitude.



4th Paleoschool Field Workshop-2022-23:Integrating field and lab results in Human - Climate interactions

30th December 2022 to 1st January 2023

Report By - Dr. Prabhin Sukumaran, CHARUSAT, Changa, Gujarat

The 4thPaleoschool Field Workshop-2022-23 was organized with a focal theme of "Integrating field and lab results in Human-Climate interactions".The event was specifically planned during the visit of Prof. Stanley Ambrose to India so that we would be able to informally disseminate first-hand knowledge to young, early career researchers. Prof. Ambrose is an internationally acclaimed stable isotope geochemist and paleoanthropology researcher based at the University of Illinois in the US.A wide publicity of the event was done through social media, personal communications, and digital media.A total of 33 candidates ultimately registered for the event, of whom 6 were shortlisted for the field school based on their employment status, geographic location, statement of purpose, and CV.

The participating candidates were from diverse disciplines and institutes. Participants from Kalahandi University, Bhawanipatna, Odisha, the Indian Institute of Technology Gandhinagar, and the Dr. K C Patel R & D Centre at the Charotar University of Science and Technology, Changa, Gujarat,successfully participated in the event. During the three-day field school workshop, participants visited key geoarchaeological sites such as Patne and the Quaternary section at Sakegaon, which we have studied using multiple proxies.The base station for the workshop was Chalisgaon for the

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initial couple of days and Jalgaon for the last few days. Prof. Ambrose discussed such topics as stable isotope geochemistry and associated sample collection, analytical protocols, and interpretations. Dr. Parth Chauhan covered issues related to stone tool technologies, modern human evolution research, and the relevance of India. Dr. Sukumaran covered topics such as high-resolution multi-proxy analysis, the landform building process, and the integration of results spatially and temporally using modern tools and technologies. The event was financially supported by the Charotar University of Science and Technology and the Association of Quaternary Researchers (India).

National Training Workshop on Paleoclimate - Archives, Proxies, and Analysis/ Measurement Techniques (NT-PALEO 2023)

Report - Dr. Naveen Gandhi, IITM Pune

NT-PALEO 2023 was conducted by the Development of Skilled Manpower (DESK), MoES, and Paleoclimatology teams at CCCR, IITM, from January 16–20, 2023, at IITM and was live-streamed to BIMSTC (Bangladesh, India, Myanmar, Sri Lanka, Thailand, Nepal and Bhutan) nation's institutes via the IITM YouTube channel. The training workshop was part of the activities of the Association of Quaternary Researchers (AOQR), which aimed to motivate young students from India pursuing their master's degree courses or in the early stages of their Ph.D. by making them aware of the advancements in the field of paleoclimate research in India. The workshop had lectures, hands-on training experience, lab visits, and field trips. A total of 57 participants attended the workshop. All the participants were provided free lodging, boarding, and return train fares to participate in the workshop.




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This training workshop had lectures and laboratory training that were conducted by scientists/experts from IITM, Pune, the Physical Research Laboratory, Ahmedabad, IISER-Pune, IISER-Mohali, Agharkar Research Institute, Pune, SPPU, Pune, the National Centre for Earth Science Studies, Thiruvananthapuram, the National Center for Ocean and Polar Research, Goa, the Birbal Sahni Institute of Palaeosciences, Lucknow, the Cluster University of Jammu, and the Borehole Geophysics Research Laboratory, Karad. One-day fieldwork was arranged at Nigoj and Wadgaon Darya (near Pune) to provide basic training about sampling, site surveys, and the identification of various paleoclimatic archives. Laboratory training was carried out at IITM, IISER-Pune, SPPU, Pune, and Agharkar Research Institute, Pune, to provide hands-on experience with the state-of-the-art instruments and measurement techniques in the field of paleoclimate research. IITM offered hands-on training on the latest/updated statistical tools/ software packages used for paleoclimate research. The workshop's playlist (day-wise) is available on the IITM YouTube channel.

For the first time, a project from the subcontinent of this size has been approved by the International Union for Quaternary Research (INQUA). The Landcover-Landuse of Ecological Regions of the Monsoon (LEM) project as approved under the Humans & Biosphere commission (HABCOM) of INQUA is hosted at the Birbal Sahni Institute of Paleosciences (BSIP), Lucknow. This project aims to map and model landuse and landcover indicators in different ecological regions of the monsoon to quantify modern analogues of the climate variations in the last 100 thousand years. This will address knowledge gaps prevalent in the monsoon biomes for natural climate change patterns during the late Quaternary time period, enabling the differentiation of anthropogenic effects and quantifying the dependability of hindcast and forecast assessments in different locations. Outreach interactions were undertaken to introduce the concepts of biodiversity, conservation and sustainable development to the general populace, especially young students of these ecologically significant regions, which is much needed but rarely attempted during scientific fieldwork.

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LEM held its first International School and Symposium (LEM-ISS) from 13th to 26th March 2023 in western Vidarbha, Maharashtra, India, with the aim to understand Tropical Dry Evergreen Forests. The LEM-ISS-2023 is supported by the Department of Forest, Government of Maharashtra; the Science and Engineering Research Board (SERB), Government of India; Ministry of Earth Sciences (MoES), Government of India; and the Association of Quaternary Researchers (AOQR). Local support was provided by the Dr. Punjabrao Deshmukh Administrative Prabodhini, Amravati, and the Vigyan Bharati Vidarbha Pradesh Mandal. A total of 22 trainee participants from India, Nepal and Sri Lanka attended this school, along with other ECRs and invited experts from India, Sri Lanka, France, Austria, the United Kingdom and the United States of America.

Trainees were drawn from various backgrounds and included students of archaeology, geography, geology, botany and remote sensing. The school included in-person and online lectures, modelling and practical demonstrations, and five days of extensive fieldwork and hands-on field training on collecting surface samples for pollen analysis, surface vegetation mapping, collecting samples for dendrochronology and other proxies for developing modern analogues for palaeoenvironmental reconstruction. The school also included a visit to the Lonar Meteor crater and the UNESCO World Heritage site of the Ellora Caves. A total of eight academic sessions, with 32 invited lectures, 17 keynote lectures, and a group discussion of eminent experts was distilled into this intensive two-week field school. A public outreach program for school students was also conducted within the aegis of this field school.

The field school was concluded with a symposium where the trainee participants presented their ongoing research work and various observations noted during the course of the field sessions, bridging the gap between emerging and established researchers.

This is the start of a long-ranging project with annual field schools for research students and ECRs of Asia, along with a meeting of experts, during the flowering season in different biomes. Further, the collected samples will be processed for analysis of spatial distributions and isotopic analysis of pollen, leaf, tree rings and sediment extracts.

Finally, under the purview of the project, a South Asian Biodiversity Portal will also be designed and implemented.

Report by Akash Srinivas (Centre for Interdisciplinary Archaeological Research, Ashoka University, Sonipat) amd Trina Bose (BSIP, Lucknow)

To join QuatChron -AOQR Google Group:

Open https:// groups.google.com, login (using Gmail account), search for "QuatChron_AOQR" and ask to join.]

Quaternary Chronicles
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Significant new manuscripts/ books/ monographs/ reviews:

1. Agarwal, S., Shukla, S.K., Srivastava, P., Sundriyal, Y., 2023. Peat sequence diatoms from Kedarnath, Central Himalaya, used to reconstruct mid-late Holocene hydroclimatic conditions. Palaeogeography, Palaeoclimatology, Palaeoecology, 612, 111381, https://doi.org/10.1016/j.palaeo.2022.111381.

2. Arora, P., Singh, P., Nawaz Ali, S., Morthekai, P., Shekhar, M., Ghosh, R. 2022. Climate Variability and Its Causal Mechanisms Over the Northeastern Indian Himalaya. In: Phartiyal, B., Mohan, R., Chakraborty, S., Dutta, V., Gupta, A.K. (eds) Climate Change and Environmental Impacts: Past, Present and Future Perspective. Society of Earth Scientists Series. Springer, Cham. https://doi.org/10.1007/978-3-031-13119-6_6.

3. Bandyopadhyay, S., Sinha, S., Kumar, A., Srivastava, P., Jana. N.C., 2023. Late Holocene river dynamics and sedimentation in the Lower Ganga plains, India. Geological Journal. https://doi.org/10.1002 /gj.4678.

4. Bhadra, S.R., Saraswat, R. 2022. Exceptionally high foraminiferal dissolution in the western Bay of Bengal. Anthropocene, 40, 100351, https://doi.org/10.1016/j.ancene.2022.100351.

5. Bhadra, S.R., Saraswat, R. 2023. A strong influence of the mid-Pleistocene transition on the monsoon and associated productivity in the Indian Ocean. Quaternary Science Reviews, 295, 107761, https:// doi.org/10.1016/j.quascirev.2022.107761.

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9. Ghosh, R., Korobi, S., Oindrila, B., Shailesh, A., Morthekai, P., Mohd. Arif, Phartiyal, B., Sharma, A., Singh, N., Paruya, D.K., Maharana, P., Shekhar, M., Bera, S. 2023. Last 10 millennial history of Indian summer monsoon in the Bengal region – a multi-proxy reconstruction from a lacustrine archive. Palaeogeography, Palaeoclimatology, Palaeoecology 609 (2023) 111308 https://doi.org/10.1016/j.palaeo.2022.111308.

10. Joshi P., Phartiyal B., Joshi M., Agrawal S., Pankaj B. 2023. Reconstruction of landscape and climate during last 7000 cal yr BP of the largest basin of the Ladakh Range, NW Indian Himalaya. Catena. https://doi.org/10.1016/j.catena.2022.106907.

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14. Malik, J.N., Mohanty, A., Sahoo, S., Gadhavi, M.S., Dhali, M., Arora, S., Naik, S.P. 2023. Signatures of 16th and 19th centuries paleo-earthquakes along the Himalayan Frontal Thrust (HFT), NW Himalaya, India: Implications to seismic hazard assessment. Quaternary International. https://doi.org/10.1016/j.quaint.2023.02.001.

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20. Prabhat, P., Rahaman, W., Lathika, N. et al. 2022. Modern-like deep water circulation in the Indian Ocean caused by Central American Seaway closure. Nature Communication 13, 7561. https://doi.org/10.1038/s41467-022-35145-0.

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Quaternary Chronicles
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CALL FOR CONTRIBUTIONS

Quaternary Chronicle (QC) publishes three issues a year seeks to publish perspectives, recently published peer-reviewed papers in Quaternary science, new developments in Quaternary science methods/ techniques, past events, awards, abstracts of recently awarded Ph.D./MS thesis; Quaternary publications, obituaries and details on forthcoming conferences/opportunities/fellowships the world over. Each issue of the newsletter will therefore, comprise news on on/from the Indian sub-continent;. It will also have a platform for discussion on emerging questions and ideas in Quaternary science and details on new books/ monographs/ reviews. QC seeks to share original results, new ideas and innovative development for the common good and a possibility to serve as a catalyst for the initiations of major and coordinated initiatives in the country.

We now accept submissions for our upcoming issues. Submit all the contributions to ***aoqr2019@gmail.com****. Themes for contributions are given below:*

1.Perspective: *Perspective write-ups on emerging trends and new possibilities in Quaternary Science (500 words).*

2.Sneak-peek and Discussion: *Share any exciting findings/questions from your ongoing (unpublished) work already to facilitate discussion. Any other intriguing facts/ unanswered questions are also welcomed for discussion (150 words).*

3.Significant new manuscripts/ books/ monographs/ reviews: *Corresponding authors of recently published peer-reviewed papers are invited to submit a brief summary of their work (not published abstract) with complete reference, web-link, and corresponding email address (200-300 words). Also, include a PDF copy of the paper in the email (for reference only).*

4.Facilities and Instruments: *A list of available facilities at various Indian institutes will be given and updated as contributions are received. In-charge of the available facilities, mentioning whether it is open access or available on payment basis, may submit the details with contact details.*

5. Achievements: *Share national or international awards/ fellowships/ recognitions with the larger Quaternary community. Also, approved SERB/ DST/CSIR/ national/ international Quaternary projects with the title, affiliation details of the awardee and a brief abstract (200 words) may be submitted with a copy of the award letter (for reference only).*

6.Projects/Collaborations: *New projects and collaborations related to Quaternary Science may also be sought for enhancing the quality of ongoing/proposed research. Submit a brief summary of the project, collaborations required and the contact details for correspondence (200 words).*

7. New Thesis: *Abstracts of awarded PhD/MS degree are invited for contribution (250 words).*

8.Opportunities: *Submit details with web-link of any new openings and opportunities for wider circulation.*

9. Social media: *Follow, discuss and share Quaternary India News on https://twitter.com/ AOQRIndia (Twitter) and https://www.facebook.com/ AOQRIndia (Facebook).*

Come join us!

The Association of Quaternary Researchers (AOQR) invites you to register for AOQR Membership and ask your colleagues and students to make the AOQR Fraternity stronger and become a part of the AOQR family.
See the details in https://www.aoqr.org/#

ISSUES	Deadlines (Last date for submission)
Issue -1 (April)	**March 10**
Issue -2 (August)	**July 10**
Issue -3 (December)	**November 10**

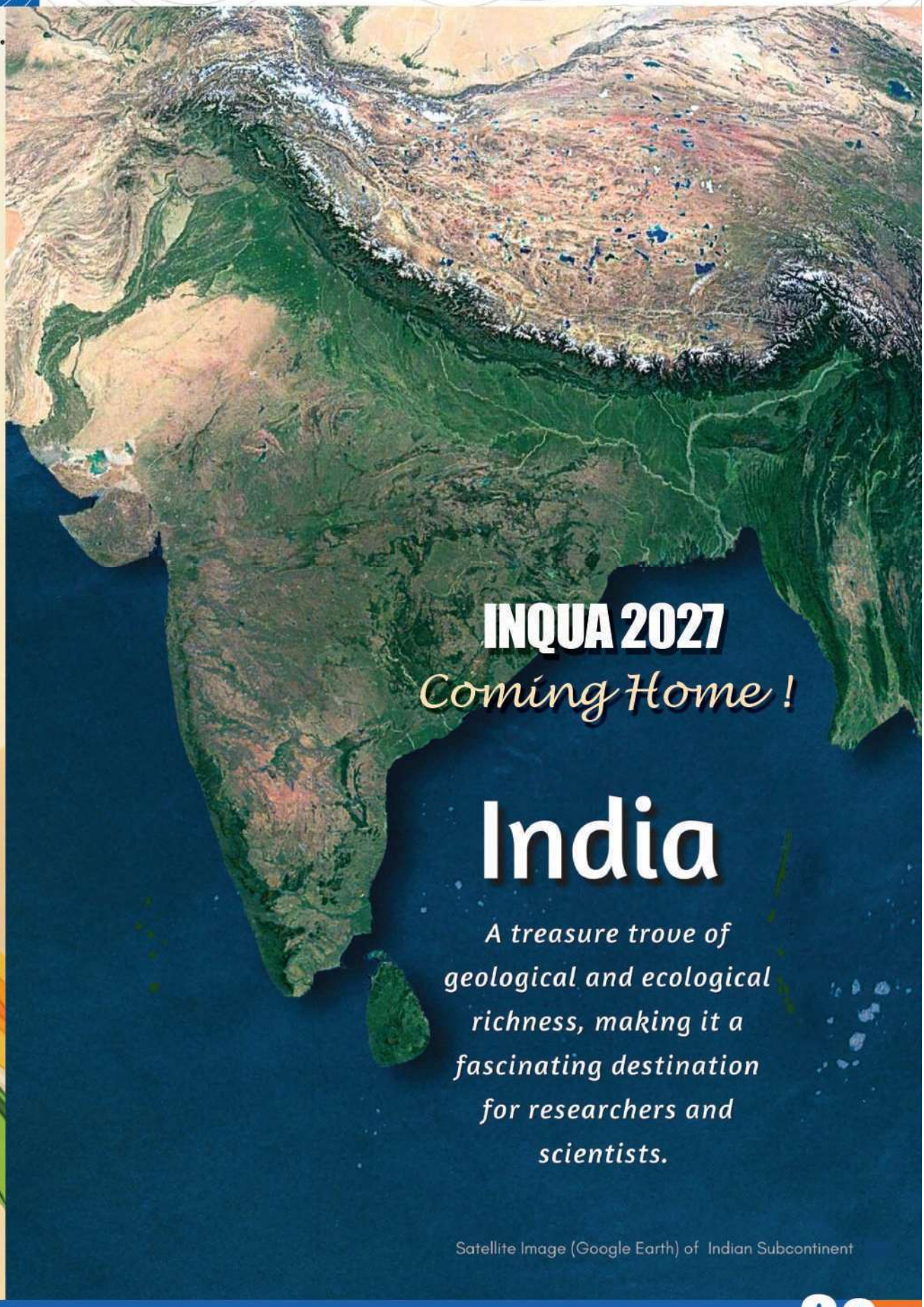
QUATERNARY RESEARCHERS

Quaternary Chronicles

Happenings in the Sub-continent

Vol.5 No. 2 August 2023

Welcome to India



INQUA 2027

Coming Home !

India

A treasure trove of geological and ecological richness, making it a fascinating destination for researchers and scientists.

19 -26 FEB
LUCKNOW

Satellite Image (Google Earth) of Indian Subcontinent

Quaternary Chronicles
Happenings in the Sub-continent

FROM THE AOQR DESK

Dear Quaternary Family,

Congratulations to all of us, the Quaternary fraternity of India for winning the bid to host the 22nd INQUA in 2027. Congratulations to the representatives of the teams from BSIP, NCPOR and AOQR who were a part of the Indian delegation at INQUA 2023 (Rome, Italy) and thanks to INSA, DST and MoES for their support in getting the 22nd INQUA to India.

There is another good news that Dr. Pradeep Srivastava, Vice-President of AOQR has been elected as the Vice-President of INQUA. Heartiest congratulations to Dr. Pradeep Srivastava!!! It is an honor for the entire Quaternary fraternity of India.

AOQR has played an important role in binding the Quaternary researchers of India in one thread and together we could do this. Several AOQR members, all office bearers, seven governing members and one Honorary member of AOQR were in Rome, Italy to attend the INQUA 2023 (13-20th July), along with our President Dr. Vandana Prasad. Her efforts in taking this bid forward are boundless. The team was led by Prof. D. M. Banerjee, Chair of INSA National Committee for IUGS and INQUA, and with the blessings of all our senior members and wellwishers our team effort worked in bringing home INQUA. It will be the first time that INQUA steps into the subcontinent since 1928, the year of its formation. It is a moment for all of us to celebrate and also realize the vast responsibility that we now have on our shoulders . Hard work for all of us begins as in no time this preparation time will pass by and we will be there welcoming the 22nd INQUA participants from all over the world. We need to plan our science, plan our field visits, plan the research we need to showcase, plan our work, and present our best to make INQUA India memorable. Let us all make full use of this opportunity to take our Science to a global level. Researchers like you will need to help the scientific community to deliver, hence your support is needed at all point of time.

Once again, congratulaions from the AOQR office bearers and governing body members. The dream of the honorary members of AOQR and the senior Quaternary researchers who have been our pillars, our giant shoulders, our torch bearers is coming true. INQUA 2027 will he held in Lucknow and all the details of the bid are there in the website ***www.inquaindia2027.in.***

India has a lot to offer to the global Quaternary fraternity and we will make it the best INQUA ever.

Binita Phartiyal
Secretary, AOQR

@INQUA 2023, ROME

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AOQR QUATERNARY RESEARCHERS

AOQR - Governing Body

Editorial ECR Team

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School of Earth & Env. Sciences, University of St Andrews, UK
Dr. Akash Srinivas
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Scientist, BSIP, Lucknow, India
Dr. Trina Bose
Scientist, BSIP, Lucknow, India
Dr. Senthil Kumar Sadasivam
Asst. Prof., National College (Autonomous), Tiruchirappalli, India

The ECR team is thankful to all volunteers and members of AOQR to take this newsletter to a wider audience.

AOQR MEMBERSHIP CALL

Researchers of Quaternary Science of Indian sub-continent are welcome to submit your application. Be a part of a multidisciplinary team of researchers, and practitioners of Quaternary Science and represent Indian Quaternary Science at an international level. Members can get priorities at our annual e-conferences, publish in the edited books/ journal volumes by the members of the AOQR, access to webinars, e-conferences and specialized thematic workshops etc.

Write to us at **aoqr2019@gmail.com**
for membership application form.
The membership of the AOQR is open to all individual of academia and industry subject to verification.

Welcome!

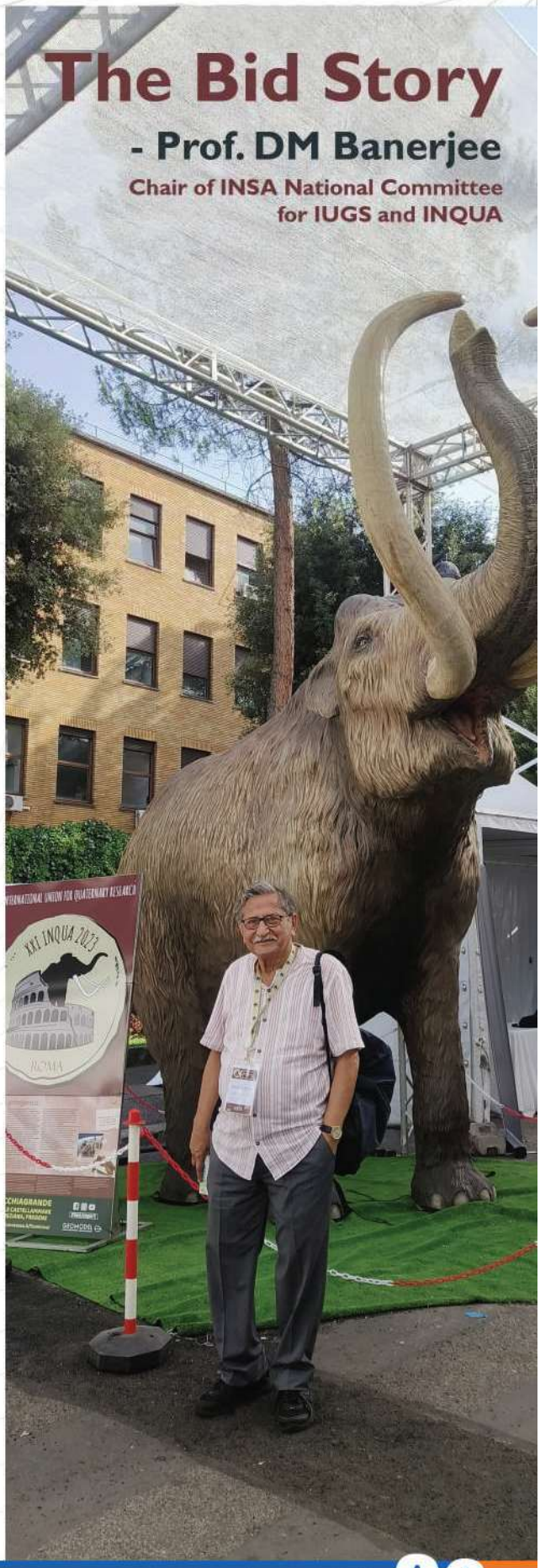
Quaternary Chronicles
Happenings in the Sub-continent
QUATERNARY RESEARCHERS

July 23, 2023, New Delhi

The Bid Story

- Prof. DM Banerjee

Chair of INSA National Committee for IUGS and INQUA



Last evening, I expressed my appreciation for the special camaraderie among the Members of the Bidding Team and numerous Indian participants at the Congress and gave that message to all WhatsApp connections. Today, through FB pages, I narrate the Bid story more explicitly. The story began nearly 5 years ago when Prof. Ashok Singhvi as Chair of the then INSA Committee motivated BSIP, Lucknow; WIHG, Dehradun, and NIO, Goa scientists to compile a Bid Proposal for holding the INQUA 2023 Congress in India. The bid was presented at the Dublin Congress (July 2019) with BSIP, Lucknow as the Lead organization. Due to unexplainable reasons, India lost the bid and the Indian group fell into a deep depression until, forward-looking scientists at the BSIP teamed up with Dr. Binita Phartiyal duly supported by her Director, Dr. Vandana Prasad and worked intensely to create an Association of Quaternary Researchers (AOQR). The Association grew into a scientific body and attracted several hundred memberships all over India.

The BSIP team now felt confident and proposed to make another bid in 2023 with the support of NCPOR, Goa, and AOQR. Initially, there was some apprehension about the advisability of repeating the bid but that objection was however got resolved. With the blessings of the Ministry of Earth Sciences (MoES) through Dr. Vandana Chaudhary and Dr. Rahul Mohan (NCPOR) and the INSA through Dr. Pradeep Srivastava, the bid for the INQUA Congress 2027 was prepared with the intense involvement of Dr. Ashok Singhvi who, in my opinion, is the father figure of Quaternary sciences in India. I provided my advisories as and where needed. The bid was approved at the INQUA Council meeting in Rome on 19th July in my presence. On 20th July the award was made public at the formal Valedictory function. It was a great day since the Award Acceptance speech was given by the Indian Ambassador to Italy, Dr. Neena Mehrotra. It was fortuitous that I am serving as the Chair of the National Committee for INQUA and hence performed the role of the leader of the Indian delegation. I wish to put on record that the INQUA bidding team worked in tandem with each other and every member, and each and every Indian attendee performed his/her roles on the India 2027 Booth and canvassed for the success of the Indian Bid. The major share of applause for the success of the Indian Bid should go to Dr. Binita Phartyal, Secretary General Designate, Prof. Pradeep Srivastava, President Designate, Dr. Rahul Mohan, Vice President Designate and Dr. Vandana Prasad, Chief of the Organising Committee. All of these scientists are associated with AOQR since the beginning and have played an important role in getting it registred. The Indian National Science Academy played its role successfully as the Bidding organization in its capacity as the Adhering Body of the International Science Council, of which INQUA is a Member scientific body. Not only the Quaternary scientist but the entire Indian geoscientific community is elated to know the outcome of our Bid.

On behalf of all Indian geoscientists, I am willing to venture in giving assurance to the Indian INQUA Congress 2027 organizers about total cooperation in making this Congress, a big success story.

- Regards to all,
D M Banerjee

QUATERNARY RESEARCHERS

Quaternary Chronicles

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LITTLE Moments BIG Memories

Quaternary Chronicles
Happenings in the Sub-continent
INDIAN ASSOCIATION OF QUATERNARY RESEARCHERS

INQUA
Founded 1928

இதனை இதனால் இவன்முடிக்கும் என்றாய்ந்
ததனை அவன்கண் விடல்.

- Thirukkural, No 517 (in Tamil Language)

Ithanai Ithanaal Ivanmutikkum Endraaindhu
Adhanai Avankan Vital - (Transliteration)

Assured this man will do this task this way, Leave it to him.

One of the fundamental principles of the modern management, the delegation of powers has been explained in Thirukkural, no 517. In simple words, it means, "Only right persons should be selected and be handed over the portfolios by a Head of Country or an Organization".

INQUA had made it right,

by selecting Dr. Pradeep Srivastava

as Vice-President, INQUA 2023-2027

Prof. Pradeep Srivastava, IIT-Roorkee

Many Congratulations!

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Quaternary Chronicles
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INQUA QUATERNARY RESEARCHERS

That is wonderful news and congratulations for all the hard work you have put in to get this result. And what wonderful turnout from India. Please let me know if there is anything I can do to help.
Regards, Bob
Professor R.J. Wasson, Emeritus ANU,
Adjunct JCU and UKM.

Congrats to you all team BSIP, NCPOR, AOQR and MoES for the success of your hard work. More hardworking awaits you and I am sure you all will acredit well. Let us all make full use of this opportunity to take our Science to a higher level. People like you will need to help the scientific community to deliver.
Dr. A K Singhvi

Heartiest congratulations. Appreciate your efforts and that of the entire team. I look forward to a successful event in February 2027. Best Wishes, Prof S K Tandon

Dear Dr. Binita,
Congratulations on being elected as the Secretary General of the forthcoming INQUA meeting. Your efforts in bringing this conference to our country are really commendable. I'm sure, under your guidance, we'll have a fantastic conference.
With warm regards
Rajeev, NIP Goa

It's a great moment for Indian Quaternary workers and enthusiasts. Hats off to you, and special credits to TEAM INDIA for bringing INQUA 2027 to INDIA for the very first time. Although I couldn't make it to Rome this time, I will contribute to the best of my abilities for INQUA 2027.
Regards, Yogesh,
Scientist E, National Centre for Polar and Ocean Research, Goa

Congratulations to the entire team who tirelessly work to get the prestigious conference to India. It is a proud moment of the BSIP and the entire Indian geoscience community. I would be more than happy to contribute and help in whatever possible way in the organizing the conference. Congratulations again.
Regards, Dr Naveen Gandhi, IITM, Pune

Congratulations on this marvellous achievement of bringing INQUA-2027 to India. Its a matter of great pride for the geosciences community, who would be benefited immensely by hosting INQUA in India. Great job. Once again many congratulations to you and your team for achieving this feat. I am sure you would do a wonderful job of hosting it equally better. Any help if needed, I shall be available anytime.
Best regards, Ravi Bhushan,
Visiting Professor, Geosciences Division, PRL

Once again hearty congratulations for the successful bid. Though many people played their small bits, this bid would not have been successful without your continuous hard work and dedication. I'm always there for any kind of support in successful organization of INQUA 2027.
Best regards,
Vimal Singh,
Delhi University

First of all congratulations to eam for bringing INQUA to India in 2027. This is due to the hard work, you and your team has put in the past few months.
I know that this is indeed a big responsibility on all of us to make this a successful event. On behalf of ISR, I assure you my team's full support for INQUA 2027.
With Regards, Sumer Chopra,
Director, ISR Gandhinagar

Congratulations to your team again.
I have always been appreciative of your efforts and I assure you our full support in the organisation of the INQUA 2027.
With best wishes,
Chamyal
Former Professor and Head of Geology
The M. S. University of Baroda

Dear Binita,
Thanks for your message and particular thanks for agreeing to organize the next Congress. I am very much looking forward to it. Please let me know how I can help out in any way.
regards, Lewis
Professor and Head of Marine, Earth, and Atmospheric Sciences, North Carolina State University

Greatly appreciable to bring the INQUA event in Lucknow, India. Regards, V.C. Thakur

Great!
Congratulations to you and all for untiring efforts. Sure, I will support as much as I can. Thanks and good wishes
Dhruv Sen Singh
Professor, Centre of Advanced Study in Geology, Director, Institute of Hydrocarbon Energy and Geo resources,
University of Lucknow, Lucknow-226007

Congratulations to your team for this achievement. I was following it up and this is realy great for Indian Geosciences. I am sure INQUA-2027 will be an enriching experience for all of us.
thanks and regards
Professor Prasanta Sanyal, Department of Earth Sciences, IISER-Kolkata

It was a goosebump moment for me when I came to know that we won the BID!! Feeling so proud of it. I am aware of the Himalayan efforts that you all have taken in this regard and many thanks for all that you do! I wish to be a part of it and shoulder responsibilities in all possible ways. Thank you. Warm regards,
Senthil, National College

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Indian Participation in XXI INQUA Congress, 2023, Rome, Italy

The XXI International Union for Quaternary Research (INQUA) Congress, which took place in Rome, Italy, from July 13 to July 20, 2023, was intended to expose participants to a broad range of research areas, careers within the Quaternary science community, as well as give them an opportunity to network with international and interdisciplinary researchers. The importance of Quaternary research's worldwide implications was emphasized at the congress, along with the multidisciplinary and international efforts made to conduct research and inform the general public. The conference commenced with the INQUAROMA2023 Ice Breaker on July 13, 2023, at the Orto Botanico (Botanical Garden), Rome. The President of the Italian Republic, Sergio Mattarella, and the Minister of Research and University, Anna Maria Bernini, graced the opening ceremony of the XXI INQUA at Sapienza Università di Roma on July 14, 2023. The inauguration of the conference began with a welcome and opening of the congress by Prof. Laura Sandori (Vice Chairperson, Sapienza University), followed by speeches from Prof. Francesco Latino Chiocci (Chairperson, Sapienza University) and Prof. Thijs Van Kolfschoten (INQUA President). This was continued by the special speech by Anna Maria Bernini, Minister of Research and University. The INQUA business speech by INQUA president Prof. Thijs Van Kolfschoten was the next to explain more about INQUA and its activities. The INQUA medals and laudations were presented, followed by the business speech.

The INQUA conference was aimed at exposing participants to a breadth of research, careers within the Quaternary community and giving them an opportunity to network with international and interdisciplinary researchers. A total of 2783 delegates from different parts of the world attended this conference. There were seven themes, and 209 sessions spanning large disciplines of science showcased the state of the art research and scientific progress. There were more than 1000 posters, 1000 oral presentations, and five plenary talks. Apart from the scientific sessions, a wide range of expert workshops and short courses for all the researchers were also organized during the congress. This conference offered an excellent platform and a good opportunity to showcase India's presence in Quaternary research to members of the international Quaternary community, which would help to forge new collaborations. India had a strong

presence at the conference, and there were several oral and poster presentations that dealt with varied aspects of Quaternary research. The Indian delegation consisted of about 80 participants. Dr. Pradeep Srivastava, IIT Roorkee, presented a plenary talk on "Geology of Floods in the Himalaya". The INQUA conference in Rome was led by Dr. DM Banerjee, Chair of INSA National Comittee for IUGS and INQUA and Dr. M. Mohanty, and Dr. Usha Dixit, senior scientists from DST, and Dr. Vandana Chaudhary, senior scientist from MoES were the part of the Indian delegation. India participated in the bid process, and Dr. Binita Phartiyal and her team successfully presented the bid proposal in the council meeting to organize the XXII INQUA congress in Lucknow. The Indian delegates were also involved in advertising India's bid on the Indian Expo stall to all the other country delegates. The conference concluded on July 20, 2023, which marked the closing of the official INQUA business Closing Ceremony and General Assembly. Subsequently, in the closing ceremony, Prof. Thijs Van Kolfschoten (INQUA President) declared India's prestigious win, the 100th edition, to host the INQUA meeting in Lucknow during February 2027. The Ambassador of India to Italy, Dr. Neena Mehrotra, delivered the acceptance speech at the event. The next INQUA in 2027 will be hosted in Lucknow, India, supported by INSA, MoES and DST, New Delhi. The Secretary General, President, Vice President of INQUA 2027 are Dr. Binita Phartiyal, Dr. Pradeep Sivastava and Dr. Rahul Mohan, respectively.

INDIA's BID for hosting XXII INQUA in 2027!

Compiled by Manoj MC, BSIP, Lucknow

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PhD Awarded

Firoz Khan

Late-Pleistocene to Holocene Paleoclimatic Records from Baspa Valley And Chakrata, North West Himalaya, India

Department of Geology, HNB Garhwal University, Srinagar Garhwal, Uttarakhand.

Supervisors

Dr. Yaspal Sundriyal, Department of Geology, H.N.B. Garhwal University, Srinagar Garhwal, Uttarakhand

Dr. N.K. Meena, Scientist, Wadia Institute Himalayan Geology, Dehradun, Uttarakhand.

The Indian subcontinent is characterized by a variety of climate zones, e.g., alpine climate (Himalaya), tropical climates (central India), and arid regions (northwest India). Thesis work is conducted from two distinct climatic regions from Baspa Valley and Chakrata, NW Himalaya. Two major wind regimes, viz mainly control the modern climate system in the Himalayan region, Indian summer monsoon (ISM) and mid-latitude westerlies. The Himalaya makes the ISM more complex as eastern and southern Himalaya receive ample precipitation in summers and decrease from south to north across the Himalaya due to its complex topography.

In this research work, we reconstruct last 20 ka paleoclimatic records to understand the behaviour of ISM using multi-proxy approach i.e., environment magnetism, diatoms, stable isotope, total organic carbon, grain size and AMS 14C. We observe first interglacial phase as the Older Dryas (Bølling–Allerød) followed by the cold and dry period, namely the Younger Dryas during the Late-Quaternary period from the Baspa peat followed by the intense ISM precipitation conditions during the Early Holocene and a prolonged cold-dry event during Middle to Late Holocene. Subsequently, identified freshwater diatoms in the Baspa peat sequence are well responded to temperature change. The drastic increase and decrease in the abundance of the diatoms signifies the warm and cold climatic conditions, respectively during the Middle to Late Holocene. The Chakrata meadow indicated warming in climate during Early Holocene as well as multiple phases of warm and dry climate between Middle to Late Holocene period. Hence, we compare these two sites to understand the ISM and westerlies phenomenon in the NW Himalaya.

Pujarini Samal

Thesis title: Late Holocene palaeoclimate and palaeovegetation reconstruction from the Mahanadi River Delta, East coast of India- A multi-proxy approach.

Supervisors

Dr. S R Singarasubramanian, Annamalai University, Tamil Nadu

Dr. Jyoti Srivastava, Scientist-D, Birbal Sahni Institute of Palaeosciences, Lucknow

Understanding the impact of past climate change on rainfall/precipitation and vegetation cover is critical for forecasting future scenarios and its repercussions. The present study incorporates biotic (palynological analysis) and abiotic proxy records from chronologically constrained sedimentary strata from the lower deltaic plain of the Mahanadi River delta to reconstruct climate variability over the last 2600 years. In addition, an attempt was made to estimate future climate scenarios (for the years 2050 and 2070) using the existing distribution of two selected mangrove taxa, Avicennia officinalis and Rhizophora mucronata. Four trench sites have been chosen to better understand the research area's climate fluctuations over the last 2600 years.

The dominance of herbaceous taxa such as Poaceae and Cyperus, increased aridity index, decrease in clastic input concentrations, and low CIA and PIA values in the BL trench may indicate a relatively dry and arid climate in the study region during the Iron Age cold period (IACP) from 2600-2000 cal yr BP. A well-developed estuarine condition was found at the BT trench site during the period 2000-1500 cal yr BP due to the presence of mangroves with terrestrial species, indicating a good setting for the coastal ecology. The existence of varied mangroves and a moisture index peak in the BL trench indicates a warm and humid climate state associated with an enhanced monsoon, which may be attributed to the Roman Warm Period (RWP). Around 1420 cal yr BP, there was a dominance of Sonneratia and a reduction in terrestrial species at the BT trench site, indicating a lower precipitation condition. High moisture index and high CIA and PIA values at the BL trench site around 1100 cal yr BP may imply a wet phase with the commencement of the Mediaeval Climatic Anomaly (MCA), followed by an arid environment around 1100-800 cal yr BP. The presence of a diverse range of mangroves, trees, and herbaceous plants near the SB trench shows that the study site received

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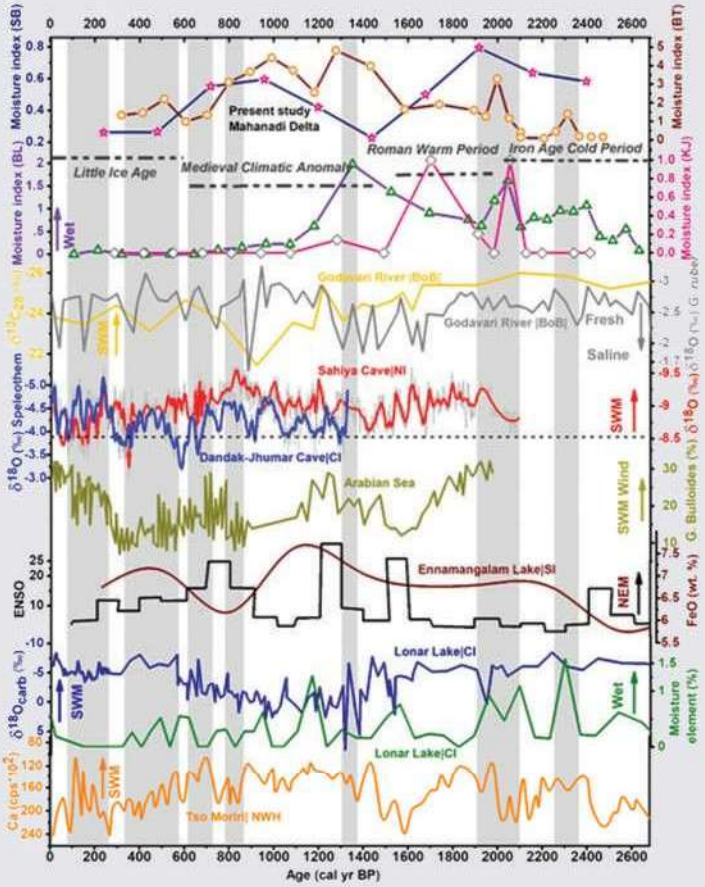

significant rainfall between 1300 and 400 cal yr BP. The abundance of Avicennia sp. reflects the development of supra-tidal back mangroves in response to aridification and forest removal in the BT trench after 700 cal yr BP. The lack of pollen records and a significant decrease in the weathering intensity at the BL trench site suggests a period of strong physical erosion and a dry, arid climate. The proxy data from all trench sites collectively shows a climate that is mostly dry and arid with little precipitation, presumably related to the Little Ice Age (LIA). According to the model predictions, Middle Holocene projections and fossil records reveal a significant expansion in the extent of appropriate habitat for mangrove species, while future climate change by 2050 and 2070 show a significant decline under the highest greenhouse gas emission scenario. Avicennia officinalis and Rhizophora mucronata are expected to experience severe declines along India's southeastern and southwestern coasts, with the loss of all stable habitats, while a moderately suitable habitat is predicted to persist along the east and west coasts, including the Sundarbans, Mahanadi, Chilika, and Gujarat coasts.

The projected habitat suitability of the dominant mangrove species in our study would be relevant in the implementation of mitigation and adaptation methods in the identified risk areas to lessen the impact of climate change on the coastal vegetation of the Indian Subcontinent.

Shazi Farooqui

Thesis title: Geochemical Study of Late Quaternary Subsurface Sediments of lower Mahi River, Mainland Gujarat, western India

Supervisors

Dr. Anupam Sharma (Scientist-F) Birbal Sahni Institute of Palaeosciences, Lucknow.
Prof. Munendra Singh (Centre of Advanced Study in Geology) University of Lucknow.

The Quaternary period represents a mere 0.05% segment of the geological time scale. However, it is the most eventful period in respect to climate change (~50 glacial-interglacial cycles), human evolution and biotic productivity. Sediment cores from deep oceans and ice-cores from the Greenland and Antarctic regions have refined our understanding in relation to the chronology and mechanism of climatic changes of the recent past. Contrary to this, the precision and understanding based on fluvial records are lacking, particularly in relation to the subcontinent's monsoonal and climatic cycles. Although continental records are often discontinuous due to weathering, erosion and periods of non-deposition, they do, however, provide critical and high-resolution information when compared to the oceanic records. Therefore they attract workers to study these deposits from all across the globe. Nevertheless, the correlation of the fluvial record with known global oceanic events is central to the understanding of climate change.

The present study deals with three sediment cores retrieved from localities, Rayka (~27 m), Rampura (~25 m) and Chokari (~17.28 m), along the lower reaches of the Mahi River lying in the Gujarat Alluvial Plain (GAP), which is a result of extensvie sedimentation by west flowing rivers during the Pleistocene period. Over the last three decades, the GAP has been studied extensively for tectono-climatic aspects as it is sensitive to global and regional climatic changes. Depositional and weathering history, provenance, paleoclimate, sea level fluctuations and tectonics of the GAP for the last >115 ka (dating back to MIS-5e) has been addressed through multi-proxy analyses including sedimentological, textural, petrological, mineralogical, palynofacies and multi-element geochemical investigations along with OSL chronology.

The Rampura sediment core, dated from >115 ka to ~6.7 ka (Late Pleistocene to Holocene), underwent various tectonic episodes and was deposited under a fluctuating climate. It starts with a bottommost clayey silt of marine origin (equivalent to MIS-5e), which is overlain by thick fluvial sediments, and is capped by a deflation lag of aeolian nature. Moreover, the Rampura sediments record signatures of the strengthening and weakening of the Indian Summer Monsoon (ISM), a northward shift of the intertropical convergence zone (ITCZ) and associated aridity during MIS-3, and drier events such as LGM, YD and OD.

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Geochemical signatures of Rampura and Rayka cores, particularly the ternary diagrams (A–CN–K and A–CNK–FM), MIA and elemental ratios suggest that most of the sediments are incipient to moderately weathered and indicates a greater contribution from the Deccan volcanic province in the catchment region. Additionally, the higher concentrations of lithic fragments (17%), feldspar (9%), and presence of pyroxene and amphibole also advocate for higher physical (less chemical) weathering. A significant reduction in grain size and presence of unstable minerals reveals that the sediments are texturally mature but chemically immature. The Index of Compositional Variation (ICV) and the Na2O/K2O vs. log SiO2/Al2O3 and Th/Sc vs. Zr/Sc plots characterize the sediments as arkosic and show limited reworking. The REE pattern and Al2O3/TiO2 (8-20) indicates a mixed contribution from both mafic and felsic sources. Through the mass balance calculation for the Rampura and Rayka sediments, the contribution from the Deccan volcanic province is quantified as 75-90%, probably linked to its more extensive aerial distribution as well as its ease of weathering under earth surface conditions in the catchment. The ~17m thick Chokari section is divided into two halves by a 1m thick gravel bed. The gravel bed indicates an enhance precipitation or tectonic activity (~1.7 ka) in the catchment area during the Late Holocene. Prior to the deposition of the gravel bed, the Late Pleistocene sequence shows the presence of a palaeosol containing alternate sand-silt layers where occasional cross bedding (in the exposed section) with relatively higher carbonate (~12%) and CIA (59-65), indicates chemical weathering in oxidizing conditions linked to terrestrial fluvial deposition. Post the deposition of the gravel bed sequence, the deposit is divided into two phases. Phase-II, dated to 1.53±0.03 ka, suggests a derivation of sediments either by tectonic activity or flooding event due to intense Indian summer monsoon (ISM). Phase-III, dated to 1.03±0.07 ka, is characterized by moderately sorted, unimodal, and silt dominated sediments indicating a low energy depositional environment which further attests to earlier observations of a herring-bone structure. Low carbonate (4.2%), the dominance of smectite along with chlorite and the dominance of the Botryococcus alga, along with the sporadic distribution of copepod egg envelopes, amorphous organic matter (AOM) and oxidized dinocysts (in extremely low frequency) indicates the submergence of land caused by high sea level, forming an estuary during the Early Holocene. Overall, the present work validates the earlier field-based understanding of the region through deeper insights across a range of studies from sedimentology, through textural, mineralogy, and geochemistry, to geochronology.

Sharavi Agarwal, IIT-R

Thesis Title: Holocene and historical record of palaeoenvironment and Extreme events using diatoms and river morphology.

Supervisors:

Prof. Yaspal Sundriyal, (Department of Geology, HNB Garhwal University)

Prof. Pradeep Srivastava, (Department of Earth Sciences, IIT Roorkee)

An extended perception of climate variability can be obtained by studying climate-dependent natural phenomena, providing a proxy record of climate and the basis of palaeoenvironmental studies. To fully anticipate or predict climatic variations in the future, it is crucial to understand the Holocene and historical dynamics of climatic changes. Kedarnath is situated in the Higher Himalayas, where the intensification of monsoon profoundly influences the regional climate and thus provides a unique set up to study palaeoclimate through Holocene peat sequence and historical records of river morphology defined by climatic fluctuations. This thesis addresses the peat deposits and the modern surface sediments from Kedarnath to understand environmental changes over the past ~8000 years; and how the dams in the Himalayas induce geomorphic dis-connectivity during extreme hydrological events.

Firstly, the present thesis work provides the first high-resolution diatom data for the mid-Late Holocene using a well-dated peat sequence from Kedarnath. Diatoms concentrations and diatoms community composition has been used to reconstruct the hydroclimatic conditions over the mid-Late Holocene. Here, a PCA-based semi-quantitative water table reconstruction through diatom species abundances shows a coupling with total diatom

concentration and autecologies of different diatom species. The mid-Late Holocene is evident with wet conditions at Kedarnath, at ~5656-5307 cal yr BP, ~4310-4264 cal yr BP, ~3515-3024 cal yr BP and ~1679-988 cal yr BP. The temporal changes in diatom concentration and the associated water table fluctuations showed a positive correlation with the Indian summer monsoon (ISM) intensity, whereas a negative correlation with the westerlies. Thus, the interplay of ISM and westerlies may have controlled the diatom growth in the Kedarnath peat. Diatom concentrations in the Kedarnath peat reduced drastically in the recent past (~988-300 cal yr BP) indicating that the peat sequence receives less wet conditions and is probably on the verge of deterioration.

Next, the June 2013 extreme event in Kedarnath hit the Mandakini-Alaknanda River valley resulting in devastating floods. This thesis dealt with the pre- and post-flood event changes in channel morphology over the last decade (2010-2020), discussing the impact of the 2013 extreme event; the role of the gradient in morphological patterns in the river basin system, and how the hydroelectric reservoir may have impeded the natural impact of the disaster and created geomorphic discontinuity. This work analysed the spatio-temporal variations in channel morphology over 2010-2020. It highlighted how channel parameters like the thalweg shifts, active channel width, and area under sedimentation responded, from headwaters to the lower gradient Lesser Himalayan zones, to the 2013 event and suggests any positive changes in these parameters diminish soon after the reservoir. The study implied that the capability of the reservoir to adjust the sediment load of the event in its upstream is an immediate short-term effect but brings out the fact that it creates a geomorphic disconnect in the channel between upstream and downstream channel reaches of the reservoir. This disconnect may have a negative impact on sediment storage and sediment-water routing of the river and should be factored into the dam design, ensuring a natural continuum to geomorphic processes. Further, the study argued that the terrain north of the Main Central Thrust (Higher Himalayas) should be kept free from major human interventions to reduce flood hazards.

Here, the research has focused majorly on two directions: diatoms proxy in peat-based proxy recorders for palaeoclimate and palaeoenvironmental study, and, the spatio-temporal geomorphic analysis of river channel morphology and how dams in the Himalayas induces geomorphic dis-connectivity during an extreme hydrological event. These two lines of research were interconnected through the development and validation of environmental change in the Central Himalayas.

Shashi B. Mehra, IISER Mohali

Title: Late Pleistocene Environments across North-Central India and Implications for Hominin Adaptations with Special Reference to the Lower Son Valley, Sonbhadra, Uttar Pradesh

Supervisor:
Dr Parth R. Chauhan, IISER Mohali

This study aims to better understand the hominin-environmental interface by investigating various types of paleoanthropological sites in western India (Gopnath, Gujarat), central India (different localities in Narsinghpur and Sehore districts in Madhya Pradesh) and north-central India (Doma in Uttar Pradesh). It also explicitly focuses on understanding the Palaeolithic/microlithic assemblages and related palaeoenvironmental dynamics of the Lower Son Valley (LSV) in the Sonbhadra district of Uttar Pradesh in north-central India. During surveys, 61 new Palaeolithic and microlithic sites were identified along with three vertebrate fossil sites in the valley. Furthermore, a ~11-meter-deep geological excavation was also conducted to reconstruct the regional Late Pleistocene palaeoenvironmental framework and date the associated sediments through collaborations. The study incorporates the lithic analysis of Palaeolithic and microlithic artefacts, the stable isotope analysis on fossil tooth enamel,

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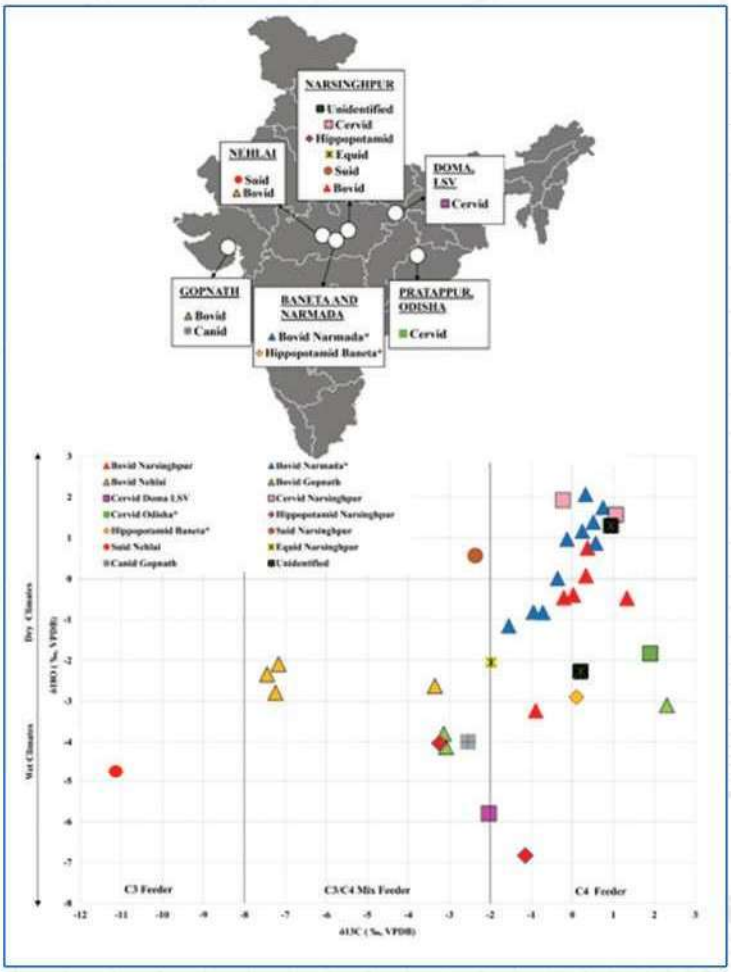


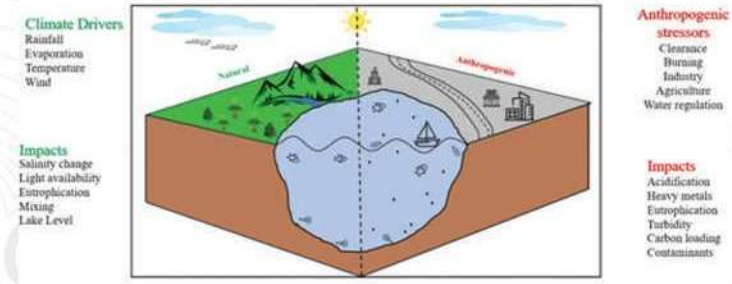
calcrete collected from western and central India, grain size analysis, X-ray fluorescence (XRF) geochemistry and OSL dating on sediments from LSV. Palaeolithic and microlithic artefacts range from the Late Acheulean to microlithic age, probably spanning the time range from ~140 kyr to 48 kyr based on currently-known evidence. Late Pleistocene records tentatively show that the period from 125-80 kyr was predominantly characterised by humid environments and was followed by varied results/changes in climatic conditions at 79-70 kyr and arid environments at 69-60 ka. Between 59 and 30 kyr, South Asia's environmental conditions were again generally humid. The period from 29-20 kyr again represents varied results, which were later followed by arid conditions from 19-11 kyr, following the Last Glacial Maximum or LGM.

Bulbul Mehta, IISER Mohali

Thesis title: Molecular markers for natural and anthropogenic organic matter sources and distribution in aquatic systems from the Indian Subcontinent

Supervisor:
Dr Anoop Ambili, IISER Mohali.

Aquatic ecosystems act as a carbon sink and contribute to vital resources in the Indian subcontinent. However, aquatic environments are subject to high rates of degradation involving natural and anthropogenic stressors and therefore, a multiproxy approach was used to have a better understanding of the influx of organic carbon components from various sources. A comprehensive approach involving lipid biomarkers, geochemical, sedimentological and environmental contaminants was used on the surface sediments collected from three study sites (Mandovi estuary, Ashtamudi estuary, Rewalsar lake) to have insights into natural and human-induced changes. The investigation done from the Mandovi estuary, west coast of India, used



geochemical (TOC, C13Corg), sedimentological (grain size) and molecular proxies (n-alkanes) for OM source apportionment. The n-alkanes proxy data suggest dominance of higher plants in the upper estuarine region and aquatic productivity along with high level of anthropogenic activities in the lower end of the estuary. Further, extensive information about anthropogenic stressors was derived from the Mandovi estuary and compared with the Ashtamudi estuary (RAMSAR site). The data based on various chemical markers suggest phthalate concentrations were higher in the Ashtamudi estuary while the petroleum hydrocarbons (hopanes, steranes and diasteranes) were abundant in the Mandovi estuary. Further, the distribution of microplastics (MPs) and phthalic acid esters (PAEs or phthalates) were examined from Rewalsar lake (Himachal Pradesh, India) and the obtained data highlight that Rewalsar lake is highly impacted by microplastic and phthalate pollution.

Overall, the thesis work emphasizes on understanding the impact of natural-human changes using OM derived biogeochemical proxies along with contaminant accumulation. The outcomes from this thesis will serve as an important baseline for future investigations in aquatic environments.

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Significant publication

Lower Palaeolithic (Acheulean) adaptations in the central Narmada Valley: New evidence from Sehore and Narmadapuram Districts, Madhya Pradesh, India

Vivek Singh[a*], Shantanu Katiyar [b], Nupur Tiwari[c], K. Krishnan[d], Parth R. Chauhan[a]

a Department of Humanities and Social Sciences, Indian Institute of Science Education and Research, SAS Nagar, Sector 81, Mohali, India
b University of Ferrara, Italy
c Department of Humanities and Social Sciences, Indian Institute of Technology Bombay, Mumbai, Maharashtra, India
d Department of Archaeology and Ancient History, The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, India.

The central Narmada Valley in central India has one of the highest densities of Lower Paleolithic (primarily Acheulean) sites in the Indian Subcontinent (Singh, 2018; Chauhan, 2020). The abundance of sites in the valley can be attributed to the availability of suitable raw materials for stone tool production, extensive freshwater sources and fauna.

The current research describes new findings from field surveys conducted in the central Narmada Valley in the Sehore and Narmadapuram districts of Madhya Pradesh, India. This research aimed to identify new Acheulean sites and explains the distribution patterns and landscape adaptations of these sites. The surveys led to the discovery of 18 new Acheulean sites, along with seven core-and-flake sites and one Middle Palaeolithic site. The paper focuses primarily on the Acheulean evidence from the study area (Figure 1). The surveys were conducted between 2016 and 2019 and consisted of five field seasons. The study area covered approximately 6716 km2. The central Narmada Valley was divided into Northern, Central, and Southern zones based on the region's geography and geology. The surveys were directed towards foothills and interstream regions, as these areas were more likely to find well-preserved archaeological evidence. Lithic collections were done from both new and previously known sites, and the collected artefacts were analysed based on typology and dimensional measurements.

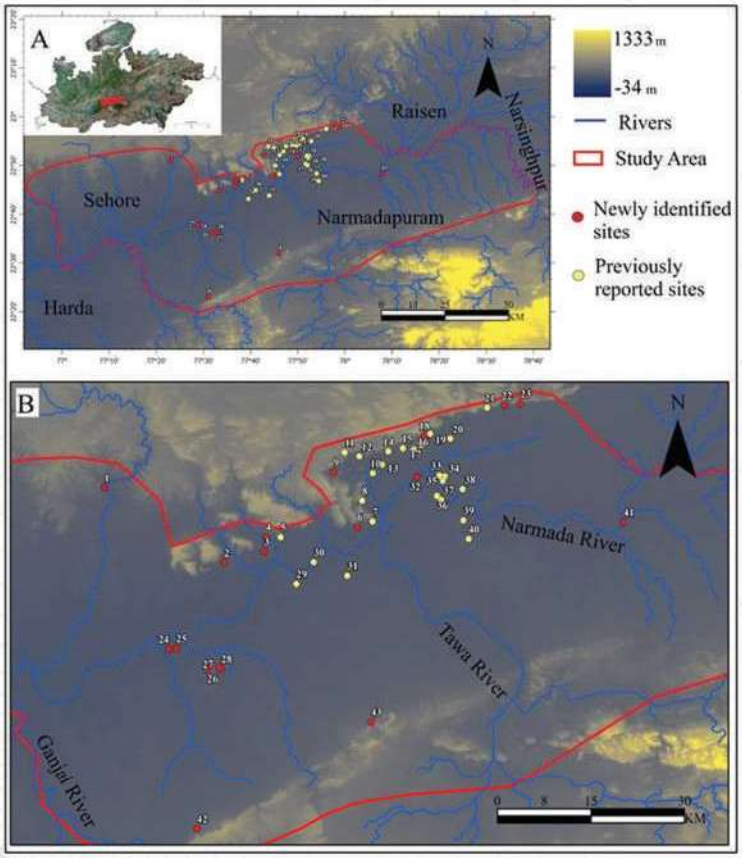

Figure 1: Spatial distribution of the Lower Palaeolithic sites in the central Narmada Valley.

The survey results revealed the presence of multiple new Acheulean sites in all three zones of the study area. The main concentration was observed in the Northern and Central zones. The richest Acheulean sites were found along the foothills of the Vindhyan range or near rocky outcrops within the valley. Smaller assemblages and find-spots were found along the banks of the Narmada River and its tributaries. All the Acheulean sites are found either on the surface or in stratified contexts. In stratified contexts, Acheulean sites in the central Narmada Valley generally occur in two types of deposits: (A) regolith mixed with colluvial matrix and (B) in situ within clay or silty-clay deposits (Figure 2).

Some preliminary observations regarding the Acheulean evidence in the central Narmada Valley are as follows: 1) Acheulean hominin populations specifically targeted quartzite from the Vindhyan Supergroup for raw material (quartzite and sandstone); 2) Most of the sites are located at raw material sources, possibly indicating low mobility; 3) Spatial patterning of different sites indicate the occurrence of different behavioural patterns and site utilisation; 4) Major exploitation of large flakes (>10 cm) is present as also observed in the rest of Indian Subcontinent Acheulean. This puts the CNV Acheulean record in the category of LFA, which is widely observed in the Indian subcontinent and the majority of the Old World; 5) The unique occurrence of disks in the Acheulean of the

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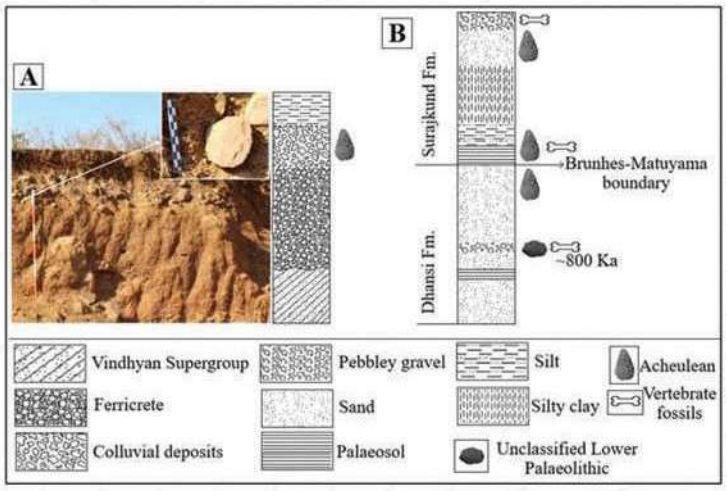

Figure 2: General stratigraphy and associated Acheulean occurrences in the CNV.

CNV. As per the literature review, these disks have not been observed at any other Acheulean sites, either locally or globally; 6) Overall preference of cleavers compared to handaxes, indicating specific subsistence patterns.

References cited in the article can be seen in the following publication:

Singh, V., Katiyar, S., Tiwari, N., Krishnan, K., Chauhan, P.R. Lower Palaeolithic (Acheulean) adaptations in the central Narmada Valley: New evidence from Sehore and Narmadapuram Districts, Madhya Pradesh, India, Quaternary Science Advances, Volume 11, 2023, 100094. https://doi.org/10.1016/j.qsa.2023.100094.

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April 18th saw the untimely demise of an excellent and meticulous scientist of the Quaternary Laboratory, BSIP, Lucknow – Dr. Ruby Ghosh

Ruby Ghosh, born on October 3, 1976, in Kolkata, West Bengal, India, graduated from the Botany Department of Ram Mohan College, Kolkata, and completed her Masters in Botany from the Presidency College under Calcutta University. She received the prestigious Birbal Sahni Research Scholarship, funded by the Birbal Sahni Institute of Palaeosciences (BSIP), Lucknow, and pursued her Ph.D. under Profs. Manju Bannerjee and Subir Bera of Calcutta University on the project "Archaeobotanical studies in the southern part of West Bengal, India",. She was a CSIR-SRF (2008-2009) in the Department of Botany, Calcutta University to study the usage of biogenic silica in quantitative reconstructions. Then she was a Research Fellow (2009 - 2010) in Palaeobotany-Palynology Laboratory, Department of Botany, University of Calcutta, on an honorary basis. She continued to work on phytolith as a CSIR-RA (2010-2011). She also had a keen interest in interacting with the graduate and postgraduate students and had an illustrious career in teaching as well. She worked as a Guest Lecturer (2001-2002) in the Botany Department at Victoria Institution (College), at the Scottish Church College (Post-Graduate Section) during 2009 - 2011, and as a part-time Lecturer of Botany in Budge Budge College (2006 2007) and in City College (2007 2009). She was a student friendly teacher.

Dr. Ghosh joined the BSIP, Lucknow, as a Scientist B and continued her research work in the fascinating field of Quaternary Palaeoclimate since 2011. She was subsequently promoted to Scientist C, Scientist D, and finally to Scientist E in 2023. She was one of the pioneers of phytolith researchers in India and abroad. Although she denied that she was not a good team player, people found it easy to work with her, and many of her publications are testimonials to that fact. Dr. Ghosh has received many accolades for her significant contribution in the field of Archaeobotany and Quaternary Palaeoclimate such as Pratul Chandra Bhandari Medal 2006 (awarded by BSIP), INSA fellowship to visit National Stable Isotope Facility (IIT Kharagpur; 2012-2013), INSA-DFG visiting scientist (2016) in Senckenberg Research Institute, Frankfurt, Germany with Dr. Angela A. Bruch , and Excellent Scholar Award (2017) in XIX International Botanical Congress 2017 at Shenzhen, China organized by the Botanical Society of China and the Shenzhen Municipal Government. She has about 45 research papers published in high quality journals and successfully completed projects sponsored by the DST-SERB, New Delhi.

Her overall appearance, persona and smile made her a gem of a person just like her name Ruby. Although she was so gentle and ever smiling, the close look would easily tell that she was strong as her proxy i.e., phytolith. Her strength and weakness is her self-critical nature. She never accepted that she was a good scientist and that made her a better scientist as we know of her. She will be missed by all she came in touch with.

Dr. Ruby Ghosh
(1976 - 2023)

In memory of an eminent scientist and an exemplary human being, Dr. Ruby Ghosh (1976–2023)

with heary hearts, Dr. Swati Tripathi and Dr. P Morthekai, BSIP

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2027

XXII INQUA INDIA

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Welcome to India

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Dr Binita Phartiyal,
Scientist-F & Organising General Secretary (INQUA-2027)
Birbal Sahni Institute of Palaeosciences,
Lucknow- 226007
INDIA

Dear General Secretary of INQUA-2027, dear Dr. Phartiyal

The INQUA Executive is delighted to inform you formally that the delegates of the INQUA Members, who attended the International Council meeting during the XXI INQUA Congress in Rome, unanimously accepted the bid of India to host the 22nd INQUA in 2027.

The INQUA Community is looking forward to visiting the Indian Subcontinent to attend the 22nd INQUA Congress with the theme "***Quaternary Science as Societal Services***".

On behalf of the INQUA Executive,

Sincerely yours,

Prof. Laura Sadori
INQUA President

Prof. Thijs van Kolfschoten
INQUA Past President

QUATERNARY RESEARCHERS

Quaternary Chronicles

Happenings in the Sub-continent

Quaternary Chronicle (QC) publishes three issues a year seeks to publish perspectives, recently published peer-reviewed papers in Quaternary science, new developments in Quaternary science methods/ techniques, past events, awards, abstracts of recently awarded Ph.D./MS thesis; Quaternary publications, obituaries and details on forthcoming conferences/opportunities/fellowships the world over. Each issue of the newsletter will therefore, comprise news on on/from the Indian sub-continent;. It will also have a platform for discussion on emerging questions and ideas in Quaternary science and details on new books/ monographs/ reviews. QC seeks to share original results, new ideas and innovative development for the common good and a possibility to serve as a catalyst for the initiations of major and coordinated initiatives in the country.

We now accept submissions for our upcoming issues. Submit all the contributions to ***aoqr2019@gmail.com****. Themes for contributions are given below:*

1.Perspective: *Perspective write-ups on emerging trends and new possibilities in Quaternary Science (500 words).*

2.Sneak-peek and Discussion: *Share any exciting findings/questions from your ongoing (unpublished) work already to facilitate discussion. Any other intriguing facts/ unanswered questions are also welcomed for discussion (150 words).*

3.Significant new manuscripts/ books/ monographs/ reviews: *Corresponding authors of recently published peer-reviewed papers are invited to submit a brief summary of their work (not published abstract) with complete reference, web-link, and corresponding email address (200-300 words). Also, include a PDF copy of the paper in the email (for reference only).*

4.Facilities and Instruments: *A list of available facilities at various Indian institutes will be given and updated as contributions are received. In-charge of the available facilities, mentioning whether it is open access or available on payment basis, may submit the details with contact details.*

5. Achievements: *Share national or international awards/ fellowships/ recognitions with the larger Quaternary community. Also, approved SERB/ DST/CSIR/ national/ international Quaternary projects with the title, affiliation details of the awardee and a brief abstract (200 words) may be submitted with a copy of the award letter (for reference only).*

6.Projects/Collaborations: *New projects and collaborations related to Quaternary Science may also be sought for enhancing the quality of ongoing/proposed research. Submit a brief summary of the project, collaborations required and the contact details for correspondence (200 words).*

7. New Thesis: *Abstracts of awarded PhD/MS degree are invited for contribution (250 words).*

8.Opportunities: *Submit details with web-link of any new openings and opportunities for wider circulation.*

9. Social media: *Follow, discuss and share Quaternary India News on https://twitter.com/ AOQRIndia (Twitter) and https://www.facebook.com/ AOQRIndia (Facebook).*

Come join us!

The Association of Quaternary Researchers (AOQR) invites you to register for AOQR Membership and ask your colleagues and students to make the AOQR Fraternity stronger and become a part of the AOQR family.
See the details in https://www.aoqr.org/#

ISSUES	Deadlines (Last date for submission)
Issue -1 (April)	**March 10**
Issue -2 (August)	**July 10**
Issue -3 (December)	**November 10**

QC
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Vol.5 No.3 December 2023

Dear Quaternary Family,

We are completing our fourth year on the 12th of this month. I would like to congratulate you on the fourth Foundation Day of AOQR. This journey has overall been a successful and exciting one. Our Quaternary researchers brought the INQUA 2027 to India for the first time. Now is the time to showcase what we have in our country. A lot of hard work and support from the entire fraternity is needed for the next three years, as in 2027, INQUA will be hosted in early February. During the entire fourth year of its journey, many training programmes and workshops were organised: the 4th Anthropology field school in Tapi Valley, organised jointly by IISER Mohali and CHARUSAT University, Gujrat; NT-Palaeo in IITM, Pune; field training during the LEM-ISS-2023, organised by BSIP in the Vidarbha region; Samudra Manthan-23 in NIO Goa. These workshops brought together many young Quaternary researchers and trained them to apply new methods and techniques of Quaternary research. Our programmes were a perfect blend of experts and the youth in the Quaternary researchers.

The AOQR Newsletter, Quaternary Chronicles, was published on time (https://www.aoqr.org/web/publication), thanks to the Secretary, Dr. Binita Phartiyal, and the ECR team for having done this endeavor so efficiently. The Indian Quaternary Congress (IQC) was established as a recurring event every two years by the Association of Quaternary Research (AOQR) and was subsequently organized by various institutions. Dr. Anoop Ambili will host the second IQC at IISER Mohali in July 2024. The congress will encompass all aspects of the Quaternary from the terrestrial and marine domains. I invite all of you to participate in this second IQC.

With these updates of yet one more year of AOQR, I take this opportunity to thank the office bearers: our Vice President, Dr. Pradeep Srivastava; our Secretary, Dr. Binita Phartiyal and our Treasurer, Dr. Santosh K. Shah, along with their teams, for efficiently managing the association activities throughout the year. My special thanks go to our Governing body and Honorary members for their guidance in the quarterly GB meetings and whenever needed. I congratulate and thank all the members of AOQR and the Quaternary family of India for their trust and faith in AOQR. Your support is always a boon to the association. We have an essential role to play in INQUA 2027 from February 1–7, 2027, and with this support, this mega event hosted in Lucknow will be a great success. We must thoughtfully begin the design of pre- and post-conference field trips and sessions. I again request all of you to contribute to this mega event in every way possible (as session conveners, field trip leaders and members, volunteers, participants, etc.). Your contributions at every level are a requirement to achieve this goal of a successful first INQUA in India.

We enter the last month of 2023, I hope the year has been successful for all of you, and I wish you a very Happy 2024. We will meet soon in the IQC-2024. Till then, Stay Safe and stay Happy.

- Dr. Vandana Prasad, President AOQR

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AOQR QUATERNARY RESEARCHERS

AOQR MEMBERSHIP CALL

Researchers of Quaternary Science of Indian sub-continent are welcome to submit your application. Be a part of a multidisciplinary team of researchers, and practitioners of Quaternary Science and represent Indian Quaternary Science at an international level. Members can get priorities at our annual e-conferences, publish in the edited books/ journal volumes by the members of the AOQR, access to webinars, e-conferences and specialized thematic workshops etc.

Write to us at **aoqr2019@gmail.com**
for membership application form.
The membership of the AOQR is open to all individual of academia and industry subject to verification.

Welcome!

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REPORT / VIEWS

Are Humans Evolving or Becoming 'Homotechnosapiens'?
A geoarchaeological perspective

Dr. Prabhin Sukumaran, CHARUSAT, Changa, Gujarat

Throughout our evolutionary journey, humans have transformed into what we proudly consider the most intelligent species on Earth. However, the critical milestones in our evolution that allowed us to outpace other animals can be attributed to our unique ability to observe, learn, and pass down knowledge to future generations. As a social species, we developed advanced learning and teaching skills that exponentially expanded our cognitive capacities, enabling us to collaborate and tackle various challenges. This article delves into whether we are still evolving at the zenith of our development or if we've embarked on a phase of declining brain development.

Our ability to learn from our experiences and convey those lessons to others has been critical in human evolution. For example, the early Palaeolithic humans who fashioned tools were vital to our evolution. We might still be using massive boulders as tools today if they hadn't shared their expertise and practices. This ability to pass down knowledge has aided our evolution, but are we today witnessing a loss in this priceless skill?

As our civilization evolves, we lose touch with some of our innate qualities. Consider the feeling of direction. The reliance on GPS and digital maps has made it difficult for the younger generation to travel using traditional east and west orientations. We've become overly reliant on technology for even the most fundamental duties, such as getting up in the morning without an alarm clock. These trends have extended to our communication habits, as instant messaging has frequently replaced phone conversations, making it more difficult to explain complicated emotions in person.

One of the most noticeable shifts is our changing relationship with writing. The introduction of artificial intelligence, such as ChatGPT, has made it easier for us to generate text. While these technologies provide ease, are we at risk of unduly relying on technology to carry out daily tasks? This shift poses the question, "Are we evolving into a new species that cannot function without constant gadget support?" Are we on our way to becoming "Homotechnosapiens," or have we arrived?

We must look to the past to understand the ramifications of these shifts and make forecasts for the future. Geologists, archaeologists, and anthropologists must collaborate to uncover prehistoric human evidence. The essay raises essential questions in the Indian context, such as the availability of specialist research teams dedicated to geoarchaeology, the level of focus placed on geoarchaeological study within Indian institutes, and the allocation of financial resources for these studies. These analyses

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underscore the importance of focused efforts in basic scientific research.

The human species has progressed far in its evolutionary journey, owing primarily to its ability to learn, exchange knowledge, and adapt. However, the contemporary world is witnessing a transformation, with an increasing reliance on technology to perform everyday tasks. This shift raises the question of whether we are evolving into a new species or have already crossed that threshold. To find answers, we must invest in research and explore our past while continuing to adapt to the changing landscape of human abilities.

Is the city of AOQR Headquarters safe from earthquakes? - Wake before the quake!

Piyal Haldhar, *BSIP, Lucknow*

The city of AOQR Headquarters, the capital of Uttar Pradesh-Lucknow, lies over the thick Quaternary sediments underlain by the Bundelkhand Granitoids and the Vindhyan sedimentary rock. Since there are no records of earthquake generation in the city and it is located in Seismic Zone–III, Lucknow is considered somewhat safer. However, several earthquakes originated in Nepal and were felt in the town over the year (8th November 2022, 24th January, 3rd October, and 8th November 2023), forcing us to re-evaluate the city's seismo-tectonic status.

The state of Uttar Pradesh is crossed over by several geological lineaments, such as the NNE-SSW trending Delhi-Haridwar Ridge (DHR), extended from New Delhi to the Garhwal region, the Delhi-Muzaffarnagar Ridge (DMR), trend ing east to west from New Delhi to Kathgodam and the Faizabad ridge (FR), running east to west from Allahabad to Kanpur and then in the north-east from Lucknow to the Nepal Himalayas. Multiple faults, like the Moradabad Fault trending NE-SW and the Bhairwan Fault near Allahabad, have also passed below this state. Besides, the ESE-WNW-oriented Lucknow Basement fault, bordering the western edge of the Faizabad ridge, has run through this city of Nawabs and intersected the Gomti River, resulting in the deviation of its course near the Chandrika Devi temple of Kathwara village. This fault also passes through the zones of slab tear in the subducting Indian lithosphere and has been active several times since the Himalaya Formation.

The Main Himalayan Thrust (MHT) is thought to have segmented as a result of this fault's reactivation, which may also have had an impact on the tectonometamorphic evolution of the Greater Himalayan sequences, which are distinguished by their opposing P-T-t-D pathways on either side of this fault at ~82.5°E. The geologists believe that the thickcover of alluvium in the Indo-Gangetic Basin in Lucknow would serve as a shock absorber, but the growing construction activities have drastically diminished the thickness of this soil cover. Furthermore, the water level in Lucknow has fluctuated significantly due to excessive groundwater extraction. According to several reports, the water level has dropped recent years by an average of >1–1.4 m/year, leaving the groundwater level 15.78 m below the surface. The state groundwater board has identified eight blocks, with Malihabad block having the maximum declination (~57 cm/year). In urban areas, Faizullaganj hasshown the highest water declination rate (253.4 cm/year), followed by Purania (153.4 cm/year) and Mahanagar (128.4 cm/year).

According to research published in a highly reputed international journal, this type of ground water extraction lowers the pore pressure,imparting compressional stress on the aquifer, resulting in its contraction and triggering subsidence. On the other hand, removing the overlying soil covers due to construction and reducing hydrostatic pressure due to

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water extraction may facilitate the expansion of the basement rocks. Hence, soon, the combination of the aquifer's ongoing contraction and expansion of the basement rocks may help release stress, causing seismic tremors in this region. Furthermore, the Faizabad fault passing through this city has been inactive for 350 years. However, this fault may be under a great deal of compressional stress due to the ongoing northward migration of the Eurasian Plate and the north-eastward migration of the Indian Plate. According to a report by the Earthquake Mitigation Department of Uttar Pradesh, 5.25 m of movement of the Indian plate could result in an earthquake measuring magnitude eight on the Richter scale on the Faizabad Fault. Seismic microzonation studies of this city have also reported that the northern and western parts of Lucknow, like Aliganj, Hasanganj, Butler colony, Indiranagar, etc., are suffering 1.6–2.6 times more level of ground motions compared to areas in the southern and eastern parts like Vikram Khand, Gomati Nagar, Telibagh, and Hudson lines.

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About the Author:

Piyal Halder, from Chandernagore, West Bengal, is working as a Senior Research Fellow (MoES, Govt. of India) at Birbal Sahni Institute of Palaeosciences (BSIP), from the Academy of Scientific and Innovative Research (AcSIR) under the supervision of Dr. Anupam Sharma (Sci-G and Head Geochemistry, TL/OSL & Coal lab, BSIP) and co-supervision of Dr. Kamlesh Kumar (Sci-D, BSIP). He is also acting as an ECR Member and Blog Editor in the GMPV Division of the European Geosciences Union (EGU). He is also a member of the TERPRO Commission, INQUA; Geochemical Society, U.S.; European Association of Geochemistry; the International Association of Geochemistry; the International Association for Structural Geology & Tectonics (IUGS Commission on Tectonics and Structural Geology) and Breakthrough Science Society.

Biomarker Signatures in Lake Sediments: *Unravelling Environmental Changes and Anthropogenic Influences*

Dr. Anoop Ambili, *ISSER, Mohali*

The lake sediments provide a unique record of ecosystem changes under the long-term influences of climate change and human activity in the watershed. The source indicators of organic matter (OM) in sediment cores are widely used as tools to differentiate between natural and anthropogenic drivers in aquatic ecosystems. The evaluation of OM sources in lake systems often relies on bulk sediment OM parameters, including the elemental carbon and nitrogen (C/N) ratio, as well as $\delta^{15}N$ and $\delta^{13}C$ isotopes. However, the selective degradation of OM during early diagenesis and overlapping values of these bulk parameters among different sources may constrain the suitability of these parameters as OM source indicator in lake sediments. A more recent approach involves using lipid biomarkers, including n-alkanes, sterols, and polycyclic aromatic hydrocarbons (PAHs) as OM tracers in lake sediments, given their resistance to diagenetic alterations.

Traditionally, the identification of OM sources using n-alkanes has been conducted on the basis of carbon chain length variations specific to organic sources. Long-chain n-alkanes (C_{27}–C_{33}) are widely recognized as indicators of terrestrial or land-derived organic matter, while short-chain n-alkanes ($\leq C_{21}$) are associated with algae and photosynthetic bacteria. Additionally, submerged and emergent aquatic plants serve as the predominant sources of mid-chain (C_{21}, C_{23}, and C_{25}) n-alkanes. Based on these variations in carbon chain lengths, several n-alkane indices have been developed to identify sources of OM in environments characterised by complex sources. One notable index is the Paq Index, calculated by determining the ratio of odd mid-chain alkanes ($C_{23}+C_{25}$) to odd mid and long-chain alkanes ($C_{23}+C_{25}+C_{29}+C_{31}$). This index serves as a discriminating tool, enabling differentiation between organic matter sources from non-emergent plants (submerged and floating) and terrestrial plants.

Additionally, the average chain length (ACL) ratio is employed, offering insights into the average number of

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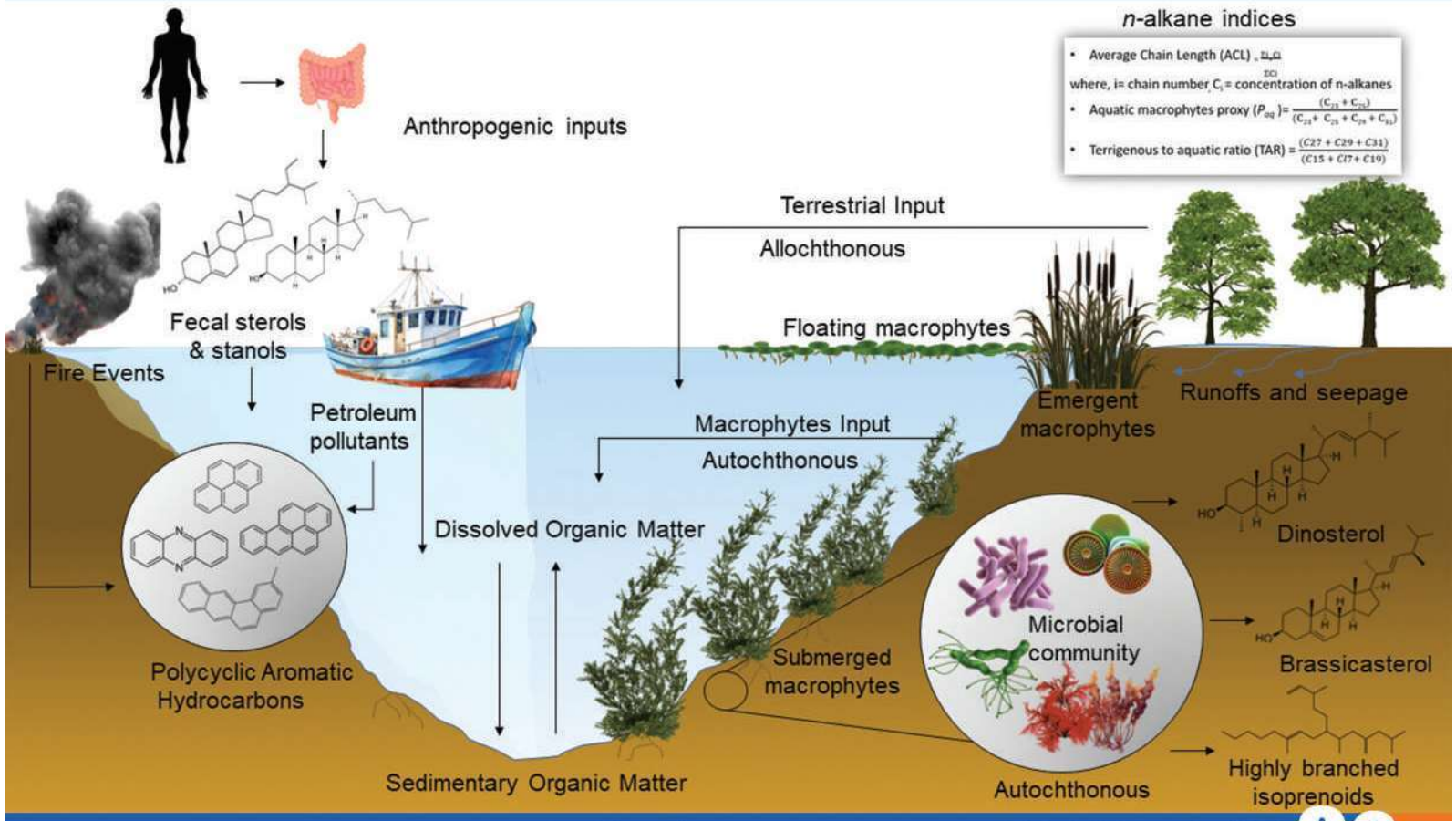
carbon atoms per molecule based on the abundance of odd carbon-numbered higher plant-derived n-alkanes. ACL proves valuable for distinguishing vegetation types and assessing contamination levels in aquatic systems resulting from anthropogenic activities. The terrigenous/aquatic ratio (TAR) stands out as another index, providing estimates of the contribution of long-chain n-alkanes (C27+C29+C31) from terrestrial plant waxes, with short-chain n-alkanes (C15+C17+C19) indicating microbial organisms. Lastly, the Carbon Preference Index (CPI) is employed to discern contributions from microbial, terrestrial, and/or petrogenic hydrocarbons by analysing the ratio of odd-numbered to even-numbered n-alkanes. Likewise, the sterols are highly regarded as the most reliable biomarkers for diatoms and dinoflagellates due to their specific biosynthetic pathways and remarkable resistance to degradation in sediment. One particular sterol, dinosterol (4α, 23, 24-trimethyl-5 α-cholest-22(E) -en-3β-ol), is almost exclusively produced by dinoflagellates. Similarly, brassicasterol (24-methyl-cholest-5, 22(E)-dien-3β-ol) serves as a prominent biomarker for diatoms. The sterols concentration in conjunction with diatom data helps to infer past variations in pH and possible relationships between potential driving climatic variables (temperature and rainfall). Further, PAHs are valuable markers commonly used in environmental research to identify and investigate the palaeofire events on various ecosystems, including freshwater systems. The changing fire regimes pose an emerging threat to aquatic species and habitats. In various regions worldwide, fires have become larger, more frequent, and more intense, often occurring outside of the usual fire season. Similar to PAHs, fecal stanols and its various diagnostic ratios serve as a significant tool to decipher anthropogenic-derived OM sources in lake sediments. The presence of faecal stanols, including coprostanol (5β-cholestan-3β-ol), and epicoprostanol (5β-cholestan-3α-ol) mark the OM contribution from sewage. In conclusion, biomarkers signatures provide insights into the presence and relative abundance of specific groups of organisms which hold extremely valuable information on the paleoenvironment, ecology, and depositional conditions over arrange of spatial and temporal scales. Further, these markers not only provide insights into the diverse sources of organic matter but also help differentiate between natural and anthropogenic influences on aquatic ecosystems. By unravelling the intricate records encoded in lake sediments, these biomarkers contribute significantly to our ability to comprehend the complex interplay of climate change and human activities over time.



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The future merging paths of Archaeology and Quaternary sciences in India – A Fresher's perspective

- Sakina Halvadwala

With a recent Master's in Archaeology from Deccan College, Pune, and through my internship experience at Birbal Sahni Institute of Palaeosciences, I have had a unique opportunity to delve into both the worlds of Archaeology and Quaternary sciences and, in the process, have gained a few insights. Quaternary Sciences and Archaeology are closely related due to an overlap in their study period. Archaeology, by definition, studies the remains of the human past, which in most cases can be very scanty. Hence, to help archaeologists extract the maximum possible information, quaternary sciences play a crucial role.

The applications of palynology in archaeology include studying the botanical remains to reconstruct past vegetation patterns and changes in them to reconstruct paleo-environmental and paleo-climatic conditions in past human societies. The extraction of pollen grains with appropriate contexts from graves could mean the past populations were burying their dead and decorating their graves or from the areas of ritualistic significance, indicating the socio-cultural aspect of the past human community. Within archaeology, geochemistry methods can be used to understand how human communities in the past altered the environment they lived in, and by using the traces of these alterations, we can infer more about their lifeways or the changes therein. The term Neolithic revolution, which is the shift from gathering to cultivation, is often cited as the most outstanding achievement of humankind. Geochemistry is perhaps our greatest tool to study and understand agriculture's origins and emerging centers. Several bio-archaeological remains are yet to be studied using the method of stable isotopes, such as the dietary patterns of mid-Holocene hunter-gatherers, especially of the communities in the Ganga plains at sites such as Sarai Nahar Rai, Mahadaha, and Damdama, early farming communities of the Deccan region, or skeletal remains found from the Harrapan sites to analyze dietary patterns, dental pathology, and even migration patterns. Organic residue, especially lipids, is extracted from ceramics where lipids might have been trapped during food processing. So far, lipid residue studies in India have focused on analyzing pottery from the Indus Valley civilization to understand their meat and dairy consumption patterns. Furthermore, an exciting application unexplored in India of lipid residue analysis would be the extraction of organic lipids from plant or animal sources from lithics to understand the functional aspects of stone tools, whether thewereas used for butchering or processing plants. Thus, lipid residue analysis could be used to study remains throughout the temporal and spatial aspects of Indian archaeology.

There are endless possible combinations of archaeological questions addressed using the methods of Quaternary Science, which can be discussed with more interactions between the researchers in their respective fields. The collaboration of archaeology and quaternary sciences has provided milestone studies with new perspectives on our understanding of the past and will continue to do so with our efforts.

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Phytological Approaches Towards New Possibilities in Quaternary Sciences

Saurav S. Gaikwad,
KTHM College, Nashik

The Indian subcontinent displays multifarious and complex biodiversity with equivalent ecological interaction and adaptation levels. The mapping of this diversity and variation among organisms is a valuable asset for exploring the dynamicity of the subcontinent. Endemism in India is also an important feature to investigate the adaptation of plants according to the environment, plant evolution, and speciation. Studying the change in the life cycle pattern of plants at present, along with past remains, helps to understand ecological changes and their impact on plants.

In the past few years, considerable researchers across the globe have been actively working on understanding paleoclimate using multiple proxies. Although an adequate amount of paleoclimatic records has been achieved, many unresolved mysteries still need to be investigated. Exploring paleo-vegetation and relating it to existing plant taxa in the present is an important part of the Quaternary Sciences. Another interesting aspect to study is the past ethnobotanical values of plants and the reconstruction of the phylogeny of taxa with their evolutionary traits. This will also lead to an understanding of the effects of anthropological activities leading to changes in plant populations and ecology. These can lead to the mapping and integration of evolutionary theories of plants. The studies can also help to understand human adaptation in a particular area due to plant diversity or abundance. Palynological data can be used to interpret diversified genera of the same families or to establish the relationship between two closely related plant families. Investigating palaeoecological records can help understand species' origin and distribution over time. The question of plant adaptation for pollination or any particular type of structure for attracting pollinators can be investigated, ultimately leading to understanding the Past Flora and Fauna Interaction that can reveal the Interdependence of Present Pollinators in the Past. Rejuvenating the past can generate helpful information for understanding future challenges. The stress and climate change response in plants can be scrutinized by Dendrochronological data (Tree-ring), and we can understand it more significantly by comparing this data with the data obtained from microfossils, megafossils, and sedimentological records of the site. The restoration strategies can be framed by understanding the variation in climate and range of species migration and its mechanisms in a biodiversity-rich zone. As a student of botany just entering Quaternary research, I can see a vast scope of new methodologies and techniques for understanding the past using plant-based parameters.

PhD Awarded

Amrutha K,
Manipal Institute of Technology

Thesis title: ***Source to sink characterisation of microplastics in the riverine environments of the Netravathi river, Karnataka***

Supervisor: ***Dr. Anish Kumar Warrier, Department of Civil Engineering, Manipal Institute of Technology***

Microplastics (MPs) are tiny pieces of plastic with a size range of 1 µm to 5 mm. They are ubiquitous and their negative impact on ecosystems make it crucial to take necessary measures to mitigate MP pollution. In this study, the source-to-sink characterization of MPs for a tropical Indian river flowing through the ecologically sensitive Western Ghats, namely the Netravathi River, has been conducted. The spatial variation of MPs mainly reflected the effect of population distribution and related anthropogenic disturbances on the distribution of MPs. The categories and polymer composition of the MPs demonstrate the contribution of mismanaged solid waste and synthetic textile fibres to the MP distribution. The seasonal variation of MPs demonstrates the effect of rainfall on the MP distribution in a river system. The effect of pilgrim centres and tourist sites near the river and the impact of the lockdown imposed on account of the COVID-19 pandemic are also reflected in the study. Policymakers can use the baseline information from this study to implement crucial measures for the regulation of plastic waste and the implementation of laws to reduce plastic pollution.

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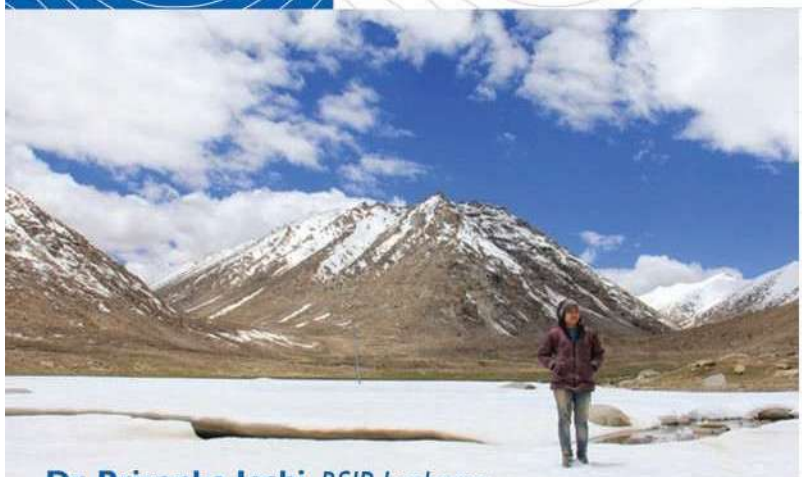

Dr. Priyanka Joshi, *BSIP, Lucknow*

Geomorphological evolution and the climatic variations in the Chang La-Tangtse and Hor La-Mahe Basin Ladakh ranges, Trans Himalaya

Supervisor: Prof. Mallickarjun Joshi, BHU, Varanasi
External Supervisor: Dr. Binita Phartiyal, BSIP, Lucknow.

The Ladakh Range, NW Trans Himalaya, is a prominent mountain range of ~350 km in length comprising a total of 47,128 drainage basins, of which the Chang La-Tangtse basin is the largest basin and the Hor La-Mahe basin falls under the category of small basins. Contemporary deglaciation has resulted in the formation of several proglacial lakes now occupying the regions where glaciers once existed. Some of these lakes along the passes (La) are accessible. The present study aims at generating a palaeoclimatic dataset of these glacial lake deposits as well as seeing the geomorphological changes in the Holocene. The crocross-valley profiles of both the studied basins are U-shaped, a typical feature of a glaciated valley. The high SL indexes and kick points indicate the tributary effect. The accelerator mass spectrometer (AMS) dates obtained from different glacial lakes show a variable sedimentation rate and represent a climatic history between ~1700 to ~7200 yr BP in the Chang La-Tangtse and from ~220 yr BP to ~11000 yr BP in the Hor La-Mahe Basin. High-resolution proxy data has been generated from these lakes using both physical and biotic proxies. The vegetation in both basins consists of mixed C3 and C4 types of vegetation. These glacial lakes show an oligo-mesotrophic ecosystem with moderate primary productivity consisting of diatoms like Didymosphenia and Cymbella; desmids like Cosmarium and Staurastrum dilalatum and testate amoebae like Centropyxis pontigulasiformis and Difflugia pulex. The pollen assemblage consists of desert-steppe vegetation, while a very high percentage of desmids is recorded from these glacial lakes, which can be correlated with the varying duration of summers in these high-altitude cold desert regions. The formation of the glacial lakes in both basins began with a cold and arid phase where glaciations were at their peak. Gradually, the climate became stable with wetter and milder conditions, which resulted in the formation of glacial lakes in the region.

Dr. Pooja Tewari, *BSIP Lucknow*

Title: Holocene climate and environment reconstruction from southwest coastal setting of Kerala using multi-proxy studies

Supervisor: Dr. Purnima Srivastava, Department of Geology, University of Lucknow
Co-supervisor: Dr. Biswajeet Thakur, BSIP, Lucknow

The Ph.D. thesis deals with the climate and environment in the southwest coastal setting of Kerala using multi-proxy studies. The main objective was to construct a comprehensive and reliable multi-proxy dataset that captures both natural and human-induced variations along the southwest coast of Kerala during the Holocene period. This dataset will establish benchmarks and ranges of variability, serving as a reference for future research.

The thesis focuses on the Holocene period, highlighting its global significance from the perspective of the Kerala-Konkan region in India. Specifically, it explores the coastal setting of Kerala and its associated landforms, such as kaỹals or backwaters, running parallel to the coastline. To address gaps in existing knowledge, this study aims to delve into the Holocene period and shed light on the importance of the Indian coastal region of Kerala. By generating a robust multi-proxy dataset, the research aims to encompass various indicators of environmental changes and human activities, both naturally and anthropogenically. The objective was to draw inferences, understand their implications on global scales, and anticipate the outcomes in a qualitative and quantitative assessment along the southwest Indian coast.

The study focused on the selection of sites, the processing of various proxies, and defining their importance and limitations. Additionally, statistical analysis is employed to interpret the ecological and environmental implications of the research. The study provides a comprehensive analysis of the subtle changes in climate, environment, and limnology at the study sites: Vembanad, Arookutty, Edathua, Mundrothruthu, and Manakudy, with the help of sediment cores to unravel the biotic proxies in understanding the climatic manifestations during the Holocene. The work aimed to define the changes in the southwest monsoon and relative sea-level fluctuations.

To sum up, the study found a lot of different records that showed how the Indian Summer Monsoon (ISM) changed over time in terms of past productivity, changes in runoff, biogeochemical cycling, trophic status, eutrophication and oligotrophy, ecotoxicity (surface sediments), and plant turnover during the Holocene Epoch. It also reflected the changing climate patterns and human practices in the southwest coastal margins of Kerala.

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Dr. Varsha Rawat

Thesis title - "Centennial Scale Variations in the Indian Summer Monsoon: A Multiproxy Record Using Deposits of Bedni and Deoriatal, Garhwal Himalaya"

Supervisor- Dr. B.S. Kotlia, Kumaun University, Nainital.
Co-Supervisor- Dr. Suman Lata Rawat, Wadia Institute of Himalayan Geology, Dehradun.

To reconstruct past Indian Summer Monsoon (ISM) variability, two well-dated lake archives from the Garhwal Himalaya were studied using a multi-proxy approach (grain size, palynology, environmental magnetism, and organic geochemistry). Multi-proxyresults of the Bednikund Lake sediments, spanning the last ~6000 years, indicated strengthened ISM during ~5930-3950 (middle Holocene climate optimum), ~3380-2830 (Minoan Warm Period), ~2610-1860 (Roman Warm Period), ~1050-760 (Medieval Climate Anomaly; MCA), and ~320 cal yr BP to the present (Current Warm Period). Weak ISM was recorded during ~3950-3380, ~2830-2610, ~1860-1050 (Dark Ages Cold Period), ~760-580, and ~500-320 cal yr BP (Little Ice Age; LIA). The ISM record from the Deoriatal Lake, spanning the last ~1110 years, showed ISM strengthening during ~1110-950 (MCA) ~690–560-560 cal yr BP. Whereas, ISM weakening was recorded during ~950–690 and ~560-290 cal yr BP (LIA). The covariance of Bednikund and Deoriatal climate records with total solar irradiance and Northern Hemisphere temperature suggested solar insolation as a primary forcing mechanism of ISM variability. Weak ISM periods broadly corresponded with Bond events, suggesting the role of North Atlantic teleconnections. The reconstructed paleoclimate record combined with archaeology and historical records indicated that ancient Indian civilizations, e.g., Indus Valley (~5200–3300 cal yr BP) and Vedic (~3400–2400 cal yr BP), prospered during periods of strengthened ISM precipitation, whereas, their collapse corresponded to decreased ISM strength. ISM weakening after ~2400 cal yr BP had little or no impact on the Indian agrarian economy due to improved administrative policies, irrigation systems, and knowledge of double cropping and cash crop production.

Keywords: *Indian Summer Monsoon, Middle Holocene, Cultural Changes, Lake Sediments, Himalaya, Multi-proxy*

Dr. Neha Kholia

Thesis Title – High Resolution Holocene Climatic Changes in Himachal Pradesh using Lake Deposits.

Supervisor – Dr. B.S. Kotlia, Kumaun University, Nainital.

This thesis deals with the reconstruction of the monsoon variability during mid-late Holocene. The climate variability of the past ~4.6 ka using the Khajjiar lake sediment core (KJR) and past ~1.78 ka using the Rewalsar lake sediment core (RWL), from the Chamba and Mandi district of Himachal Pradesh respectively was reconstructed. These lakes are located in the tectonically active Himalayan regions and receive precipitation by Indian Summer Monsoon and Indian winter monsoon (western disturbances). Based on multi-proxy data from KJRcore (765 cm), average humid conditions were observed during ~4,600-4,185, ~3,790-3,300, 2,845-2,115 and 1,555-405 cal. yr BP, improved humid conditions during 4,185-3,790 and 2,990-2,845 cal. yr BP, and dry with arid conditions from 3,300-2,990 cal. yr BP, while the fluctuating conditions were observed during 2,115-1,555 cal. yr BP.

The signatures of global dry event i.e., 4.2 ka and Roman Warm Period (RWP) were also recorded from the KJR. For RWL core (647 cm), arid conditions were observed during ~1,785-1,615, ~1,423-1,361, ~905-830 cal. yr BP, less arid conditions during 1,570-1,423, 1,361-904 cal. yr BP, while signatures of humid conditions were observed during 1,615-1,570, 830-605 cal. yr BP. The major climatic events i.e., Dark Ages Cold Period (DACP) and Medieval Climatic Anomaly (MCA) were also reported from RWL. A regional and global comparison shows broad synchronisation but considerable differences with other records mid-late Holocene. The inception and duration of events are different in diverse areas. The present work has improved our understanding of the evolution of the monsoon variability during the mid - late Holocene.

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Ningnung Jakoinao
Palaeo-Arch Lab, Indian Institute of Science Education and Research, Mohali

Title: An exploratory study of experimental cutmarks on mammalian bones and its implications for understanding tool selection and butchery skill in prehistory

Supervisor: Dr Parth R. Chauhan, IISER, Mohali

It has been known that early humans performed butchery on animals that were present at the time around them for meat consumption. Studies performed by archaeologists have confirmed this via excavations of faunal remains from around the world and have also helped reconstruct and extrapolate information in comparison to modern-day humans. These experiments map out the human evolutionary behaviour pertaining to the use of tools for cutting meat, and cutmark-bearing fossil specimens testify to this. In my thesis, I aimed to perform experimental butchery on goat and buffalo meat using stone tools made via knapping. The results of this investigation were then compared to cutmarks of archaeological specimens found at a Harappan site. I, the experimentalist, performed the butchery and aimed to remove as much soft tissue as possible from the bones using stone tools of various sizes and types, knapped by me and other such individuals. All of these activities were recorded via photography and videography. The bones were cleaned and prepared for microscopic analysis, along with the same done for the fossil samples. There were stark differences in the expertise of butchery, the location of the cutmark, and the tool type used. Irrespective of the period, this study can help understand the evolution of tool technologies, how butchery was done in the past, and observe similarities and differences between sets of cutmarked bones. These results are vital for future investigations, including ethnographic and actualistic aspects and for performing comparative studies of the expertise levels of butchery.

Yashraj Patil,

Master of Technology,
Symbiosis International
(Deemed University),
Pune, Maharashtra.

YOUNG ACHIEVERS

Yashraj Patil, a young member of AOQR, has been honoured with the opportunity to serve as a Distinguished Speaker at the United Nations General Assembly (UNGA78) Science Summit. As a UNITAR Global Diplomacy Fellow, this recognition is a testament to his commitment to addressing critical global challenges through scientific collaboration and diplomacy. Representing India on the global stage, he actively contributed insights to two virtual sessions during the summit. The first session, titled "Shaping the Future of Global Diplomacy: Insights from UNITAR Fellows and Teaching Faculty," took place on September 19, 2023. The second session, "Environmental Science Diplomacy Through Education: The Power of Knowledge and Collaboration in Addressing Global Environmental Challenges & the UN SDGs," was on September 27, 2023. The focus of both sessions aligned with his work as a UNITAR Global Diplomacy Fellow, emphasizing the importance of international collaboration and offering innovative solutions to pressing global issues. The summit provided a valuable platform to share perspectives and insights, and Yashraj is proud to have contributed to the discussions.

During the summit, he unveiled his working framework, "Science-Diplomacy-Research," which encapsulates the three pillars of his diplomatic perspective. This novel philosophy received acclaim from global audiences and diplomatic members present at the science summit. He believes that this framework is crucial in shaping the future of global diplomacy through education and science research. As a part of this endeavour, he has developed a story that encapsulates the essence of my presentation. You can view it at: https://arcg.is/yDHbf . This recognition underscores his dedication to advancing global diplomacy through education, science, and collaborative research. He is grateful for the opportunity to contribute to the ongoing dialogue on addressing global challenges and promoting a more sustainable and interconnected world.

UNGA78 Science Summit Speaker Profile: https://scienc-esummitunga78.sched.com/-speaker/yashraj.patil

GSTEM Global STEM Education Center

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CONFERENCE REPORT

1st National Oceanography Scholars Meet at CSIR-National Institute of Oceanography, Goa
28–30 September 2023

CSIR-National Institute of Oceanography organized the 1st National Oceanography Scholars' Meet, 'Samudra Manthan 23' during September 28–30, 2023. This workshop provided a platform for research scholars, post-doctoral fellows, and students working on different aspects of oceanography to come together and present and discuss recent innovations, trends, and concerns in the various fields of oceanography. This meeting marked a watershed moment in oceanography, bringing together scientists, intellectuals, and students across India to dive deep into the mysteries of our vast and complex seas.

The inauguration of the program was held on September 28, 2023, at the S.Z. Qasim Auditorium, CSIR-National Institute of Oceanography, Goa. Dr. Thamban Meloth, Director, National Centre for Polar and Ocean Research, Vasco, Goa, was the chief guest. More than 200 participants, including scholars, eminent scientists, and faculties from all over the country working in different fields of oceanography, participated in the event. Prof. Sunil Kumar Singh, Director, National Institute of Oceanography, delivered the welcome address and highlighted the need for such events at this time as the government is focusing on the Deep Ocean Mission. He said that this conference would be an ideal platform for all the young oceanographers to discuss and interact with the eminent personalities in their domain, upscaling their research to a higher level.

Further, he appreciated all the participants for attending this event from different parts of the country and wished them a wonderful event ahead. The Chief Guest of this inauguration ceremony released the second issue of the Samudra Manthan magazine of the National Institute of Oceanography student community. The conference included 17 invited talks covering the fundamentals and recent developments in oceanography.

All the interested participants were given an opportunity to briefly present their findings and to put up posters. The participants also got hands-on experience with marine sediment and water collection, measurement of various seawater parameters, operation of different geophysical instruments, and marine robotics in the field.

By: ***Dr Rajeev Sarasvat,*** NIO, Goa

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CONFERENCE REPORT

Winter School On Active Tectonics And Climate Change Driven Landscape Evolution.

Leaders:
Dr. Nicolò Parrino: *nicolo.parrino@unipa.it,*
Eshaan Srivastava: *eshaan@iitk.ac.in*

LEMON 2.0
Landscape Evolution Monitoring and Outreach Network

The main scope of the Landscape Evolution Marker Online Network (LEMON) was to increase the understanding of the climatic-tectonic interaction leading to landscape evolution in the low-strain rate regions. This includes multiple disciplines that contribute to how the tectonic and climatic forgings drive the LE and how we could use such information to assess climatic change and seismic-related hazards. The speakers focused on how a) climate change influenced erosion and sedimentation rates, b) erosion and sedimentation rates link to the LE in active tectonic areas, and c) erosion and sedimentation products could allow understanding of how and how much tectonic and climatic forcing drive LE. We aimed to pursue this research beyond the coastline's physical limit through quantitative analyses of erosion and sedimentation rates and forms, which we recognize as triggered by tectonic or climate processes. We want to estimate erosion and sedimentation rates and compare them with fault slip rates and climatic change curves, paleoseismological analyses, faults slip, and tsunami modelling. To do this, the LEMON winter school was the stepping stone in which two days of lectures and a field visit were organized. The lectures were designed in such a framework that they addressed the objectives and questions we posed in the proposal. Morpho-depositional coastal and offshore climatic signature (Prof. Attilio Sulli), Marine Terraces and active faulting (Prof. Luigi Ferranti), Active tectonics, active faulting and Paleoseismology in low deformation rate regions with insights from multidisciplinary approaches (Prof. Petra Štěpančíková), Investigating active faults using in-situ 36Cl exposure dating on Late Quaternary wave-cut platforms (Dr Jenni Robertson / Dr Francesco Iezzi), Remotely sensed shoreline evolution, a proxy for climate change? (Prof. Antonio Maltese) and Paleoseismic and Paleotsunami studies from Andaman and Nicobar Islands (Prof. Javed N. Malik). The participants also had a Guided tour of the G.G. Gemmellaro Geologic Museum, founded in 1861 by Gaetano Gemmellaro, geologist, and paleontologist. After two days of lectures, two days of field trips were organized to the southwestern Sicily marine terraces, the Selinunte Archeological Park, the S. Vito peninsula, and the Segesta Archeological Park.

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Winter School On Active Tectonics And Climate Change Driven Landscape Evolution.

SUMMARY OF RECENT PUBLICATIONS

Long term hydroclimatic variability of South-eastern Kashmir Himalaya based on stable isotopes records of tree rings

Dr. Uttam Pandey;
IITM-Research Associate,
Indian Institute of Tropical Meteorology, Pune

In the Kashmir Himalaya region, hydroclimatic conditions are shaped by the interplay of two key factors: the western disturbances and the Indian Summer Monsoon. A comprehensive analysis covering 368 years, from 1648 to 2015 CE, was carried out to gain insights into the long-term changes in these conditions. This investigation involved examining tree-ring oxygen and hydrogen isotope ratios ($\delta_{18}O$ and $\delta_{2}H$) using tree core samples obtained from Himalayan silver fir trees, scientifically known as Abies pindrow. These core samples were collected from the Pahalgam that situated in southeastern part of the Kashmir valley. The analysis of the relationship between the long and short periodicities of $\delta_{18}O$ and $\delta_{2}H$ isotopes time series indicated that the stable isotopes present in tree rings in the Kashmir Himalaya were minimally affected by physiological processes. Therefore, only $\delta_{18}O$ of tree rings were utilized for further analysis. To create a $\delta_{18}O$ chronology, five individual tree-ring $\delta_{18}O$ time series were averaged, spanning the extensive time frame from 1648 to 2015 CE. This chronology provides a valuable record of $\delta_{18}O$ variations over this extended period.

The analysis of climate responses uncovered a robust and highly meaningful negative association between the $\delta_{18}O$ values in tree rings and the amount of precipitation extending from the previous December to the current August, denoted as D2Apre. The reconstructed D2Apre (D2Arec)

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offered valuable insights into precipitation variations from 1671 to 2015 CE, and this reconstruction aligned well with historical data and other proxy-based records of hydroclimatic conditions. The reconstruction highlighted two significant findings. First, it pointed to a period of consistently higher precipitation during the latter phase of the Little Ice Age, spanning from 1682 to 1841 CE. Second, it indicated that the southeastern region of the Kashmir Himalaya had encountered drier conditions when compared to both contemporary times and historical periods. This drier trend was particularly noticeable since 1850 when substantial rainfall events became more prevalent. Importantly, the reconstruction revealed that there have been more instances of extremely dry conditions compared to extremely wet conditions since 1921.

The research findings also uncovered a teleconnection between the reconstructed precipitation patterns in the Kashmir Himalaya, represented by D2Arec, and the Sea Surface Temperature (SST) in the Westerly region. This suggests a significant link between the historical precipitation variations in the Kashmir Himalaya and the temperature of the sea surface in the Westerly region. To elaborate, a teleconnection is a climatic relationship where changes in one geographical area can influence conditions in another, often distant, location. In this case, the study identified a correlation between the reconstructed precipitation trends in the Kashmir Himalaya and the sea surface temperature in the Westerly region. This connection indicates that fluctuations in sea surface temperature in the Westerly region can impact the hydroclimatic conditions in the Kashmir Himalaya over the studied period, demonstrating the interconnectedness of climate systems across different regions.

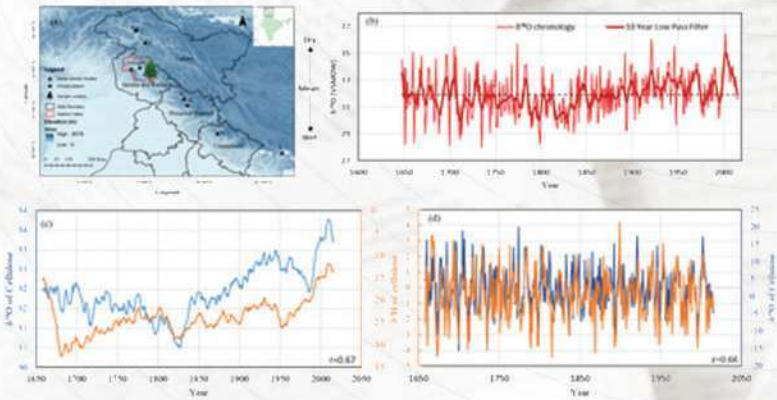


Figure 1. (a) Location map of the study area; (b) long-term variability of δ18O that defines the precipitation over SE Kasmir Himalaya; (c) Correlation between 21 years-long periodicity (21 years running mean) of δ18O and δ2H tree-ring cellulose and (f) Correlation between 21 years short periodicity (deviation from 21 years running mean) of δ18O and δ2H tree-ring cellulose.

Sediments decode climate and environmental changes on the Kaas Plateau around 8664 years BP

Link to Publication:
https://doi.org/10.1016/j.qsa.2023.100087

Dr. Karthick Balasubramanyam
Agharkar Research Institute,
Pune, Maharashtra,

A new study of the sediments from a seasonal lake in the Kaas Plateau in the Satara district of Maharashtra has indicated a major shift in the Indian Summer Monsoons towards dry and stressed conditions with low rainfall during the Early-Mid–Holocene, around 8664 years BP. Sediment profile dating back to 8000 years which helped decode climatic signatures indicated a relatively reduced rainfall and weak southwest monsoon during the late Holocene (around 2827 years BP). Kaas Plateau, nestled in the Western Ghats is about 140 km from Pune, was included in the UNESCO World Natural Heritage Site in 2012. Known as Kaas Pathar in Marathi, its name is derived from the Kaasa tree, botanically known as Elaeocarpus glandulosus (rudraksha family).

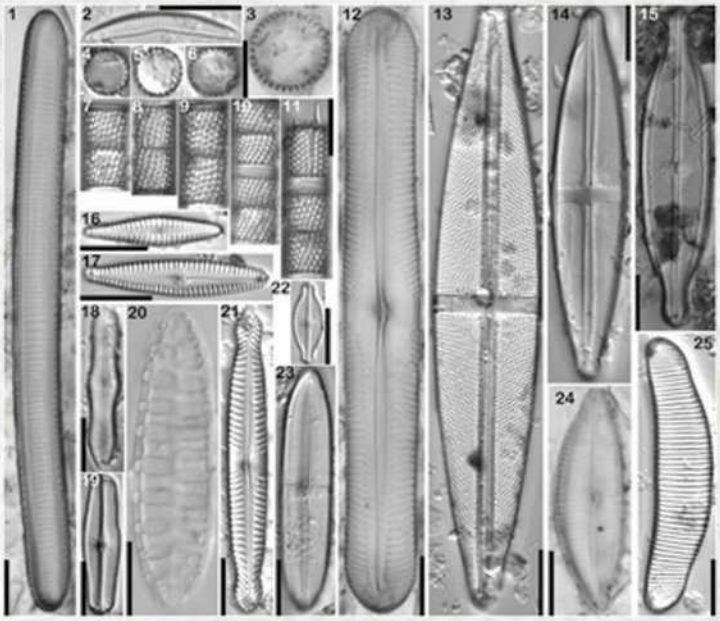


Figure 1. Diatom assemblage recovered from the sediments of Kaas Lake

Designated as a biodiversity hotspot, the Kaas Plateau comes to life with various seasonal flowers forming a floral carpet over the entire lateritic crust during August and September. Control measures have been implemented by the forest authorities to handle the pressure of nature lovers visiting the Kaas Plateau. Agharkar Research Institute (ARI), Pune, an autonomous insti-

tute of the Department of Science and Technology along with the National Centre for Earth Sciences, Thiruvananthapuram studied the sediments of a seasonal lake to understand and decipher the past climate of the Kaas Plateau. Sediment profile dating back to 8000 years which was analysed (by available carbon dates-AMS) to decode the climatic signatures, indicated that the seasonal lake favoured freshwater accumulation almost for 8000 years before the present (BP) and probably dried sometimes after 2000 years BP.

The observations from the study revealed that the seasonal lake is probably a product of an erosional localized shallow depression on a pediment (rock debris) developed over the crust. As noted by UNESCO, the present "Flower Wonder" is located on a lake that dates back to the Early-Mid-Holocene period, which means it is an ancient lake that has been preserved for a long time. The signatures of diatoms, mites, thecamoebians, and sediment characteristics provided better resolutions regarding the hydrological processes and modification of the seasonal lake. During the early to mid-Holocene, at around 8664 years ago, pollen, as well as diatom data, indicated a change in the climate from freshwater to drier conditions with low rainfall. Surprisingly, there was a significant rise in the number of diatoms in between. This suggests a major shift in the Indian summer Monsoon activity during that time, possibly resulting in intermittent humid periods amidst the dry spells. The observations of the scientists showed a decrease in rainfall and a weakened southwest Monsoon during the late Holocene (around 2827 years BP). However, during the recent past (around last 1000 years), pollen, as well as the presence of a high number of planktonic and pollution-tolerant diatom taxa indicated lake eutrophication, possibly due to human impact and cattle/livestock farming in the catchment. The study by Thacker, Mital; Limaye, Ruta B; D, Padmalal; Rajaguru, SN; Kumaran, KPN; Punekar, SA; B Karthick strongly suggests that southwest Monsoon intensified during the Early Holocene, and the northeast monsoon relatively weakened around 2000 years ago. It is very likely that the 'Flower Wonder' might have existed for a longer duration, up to March-April, during the early–mid-Holocene (8000–5000 years), when the monsoon rainfall (more than 100 rainy days) was undoubtedly better than today. The findings published in 'Quaternary Science Advances', emphasize the need for conservation measures to protect the site's invaluable natural and cultural heritage.

Figure 2. Palynological and Non-Pollen Palynomorph recovered from the sediments of Kaas Lake

ANNOUNCEMENTS

ASSOCIATION OF QUATERNARY RESEARCHERS

Association of Quaternary Researchers

President AOQR and Governing body members

Cordially invite you to the

Foundation Day Function of the

Association of Quaternary Researchers

on

Tuesday, December 12, 2023

Professor Laura Sadori
President, INQUA

will

deliver the 4th Foundation Day Talk

On

Southern European Quaternary pollen records

Function will be carried out on virtual platform (Meeting link and details of the programme will be shared shortly)

Quaternary Chronicles
Happenings in the Sub-continent

Indian Quaternary Congress 2024, (IQC-2023), IISER, Mohali

2nd Indian Quaternary Congress (IQC)
(3-5 June 2024)

Venue: Indian Institute of Science Education and Research Mohali

Theme: Quaternary Science for a Sustainable and Futuristic Earth (Q-SAFE)

Important Dates:

- Last Date of Abstract Submissions -31st January 2024
- Last Date of Registration – 1st March 2024

ASSOCIATION OF QUATERNARY RESEARCHERS

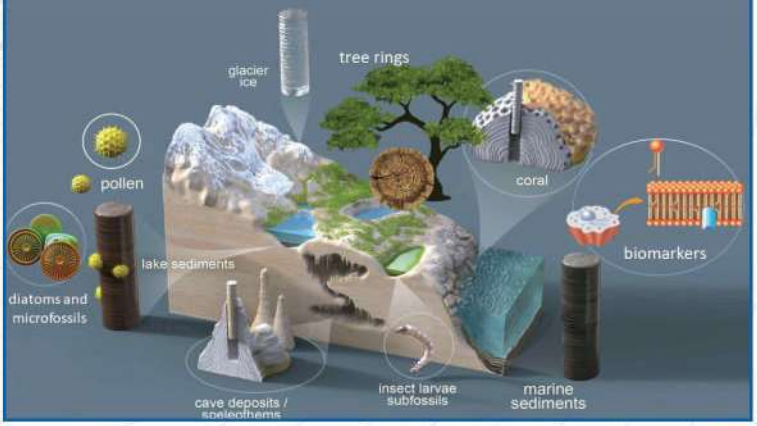
2nd Indian Quaternary Congress (IQC) 2024

Venue: Indian Institute of Science Education and Research, Mohali (India)

- Discuss the challenges and outcomes associated with Quaternary climatic study
- Promote the application of the interdisciplinary approaches in Quaternary Science
- Discuss the interface of human and societal evolution and climate variability vis-à-vis landscape evolution over the Indian subcontinent.

Important Dates:

- Last Date of Abstract Submissions -31st January 2024
- Last Date of Registration – 1st March 2024



Call for papers!!

Session on Experimental Archaeology and Actualistic Studies in South and Southeast Asia at SPAFACON 2024 in Bangkok, Thailand (June 10-14, 2024)

Session coordinators: Akash Srinivas, Andrea Dominique Cosalan and Yezad Pardiwalla (Session 11)

Abstract deadline: 29 February, 2029

Conference website and abstract submission: https://www.seameo-spafa.org/spafacon2024/callforpapers.html

Email for further information: akashsrinivas123@gmail.com

Quaternary Chronicles
Happenings in the Sub-continent

LATEST PUBLICATIONS

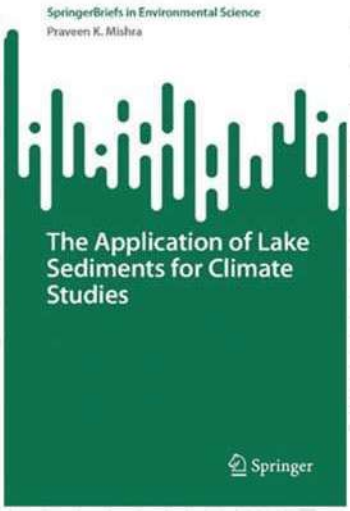
DISCLAIMER: *As this is a community-driven newsletter, the role of the ECR team is limited to copy editing and reporting only. It will be the sole responsibility of the author/ contributor to ensure the accuracy and authenticity of the contributions. The ECR team is pro-active in collecting as much useful information as possible; however, we rely on community inputs and will not be responsible for any omissions.*

Book Published

Mishra, Praveen K, 2023.

Implication of lake sediments for climate studies – a review (Publisher – Springer).

The book briefly overviews various approaches while working with the lake sediments for climate studies. This study sheds light on a multi-dimensional approach (i.e., field, laboratory, and data analysis; modern investigations; proxy development/calibration; proxy interpretation; and validation of climate models with proxy data) for climate reconstruction. The book is a valuable resource for early career researchers interested in climate studies, especially those using lake sediments as climate archives.



https://doi.org/10.1007/978-3-031-34709-2

Pandey U., Nakatsuka T., Shah S.K., Mehrotra N., Zhen L., Kato Y. Tree-rings stable isotope (δ18O and δ2H) based 368 years long term precipitation reconstruction of South Eastern Kashmir Himalaya. Science of The Total Environment. 892, 20-164640.

Muneer, W., Behera, D., Chirakkal, A., Ankit, Y., Anoop, A., Mishra, Praveen K., Jehangir, A. Historical trends of heavy metal contamination and eutrophication in an aquatic system from Kashmir Himalayas, India. Environmental Challenges, 12, 100721.

Singh, S., Mishra, Praveen K., Stefanidis, K. A critical review of morphometric parameters of lake basins from the Indian subcontinent – implications for lake management (Environmental Earth Science; https://doi.org/10.1007/s12040-022-02030-9

Mital Thacker, Kumaran K.P.N, Paul Hamilton & B. Karthick (2023) Appraisal of Asian monsoon variability in the Indian subcontinent and East Asia through the Quaternary using diatom records. Earth Science Reviews. https://doi.org/10.1016/j.earscirev.2023.104622

Samadhan Pardhi, Thiruvalan Kokila, Mital Thacker, B. Alakananda, & B. Karthick (2023) Diatoms (Bacillariophyta) of the world's highest aquatic environments from the Western Himalayas, India. Oceanological and Hydrobiological Studies. 52 (2), 172-205. https://doi.org/10.26881/oahs-2023.2.04

Thacker, Mital; Limaye, Ruta B.; D, Padmalal; Rajaguru, S.N.; Kumaran, K.P.N.; Punekar, S.A; B. Karthick (2023) "Holocene climate dynamics and ecological responses in Kaas Plateau, Western Ghats, India: Evidence from lacustrine deposits. Quaternary Science Advances, Volume 11, July 2023, 100087. https://-doi.org/10.1016/j.qsa.2023.100087

Quamar, M.F., Banerji, U.S., Thakur, B., Kar, R. (2023). Hydroclimatic changes in the Core Monsoon Zone of India since the Last Glacial Maximum: An overview of the palynological data and correlation with the marine and continental records. Palaeogeography, Palaeoclimatology, Palaeoecology 111844, DOI.:10.1016/j .palaeo.2023.111844.

Sherawat, J.S., Agarwal, S., Kenney, A.P., Grimes, V., Rai, N. (2023). Use of strontium isotope ratios in potential geolocation of Ajnala skeletal remains: a forensic archeological study. International Journal of Legal Medicine. DOI.: 10.1007/s 00414- 023-03 109-8

Sehrawat, J.S., Rai, N. (2023). Identification of fragmented cranial remains excavated from a site adjoining Ajnala well: a forensic anthropological case report. Egyptian Journal of Forensic Sciences 13. DOI.: 10.1186/s41935-023-00362-1

"The real voyage of discovery
consists not in seeking new
landscapes, but in having new eyes"

May you have new hopes, aspirations & resolutions for the coming year.
HAVE A HAPPY NEW YEAR 2024!

ASSOCIATION OF QUATERNARY RESEARCHERS

QUATERNARY RESEARCHERS

Quaternary Chronicles

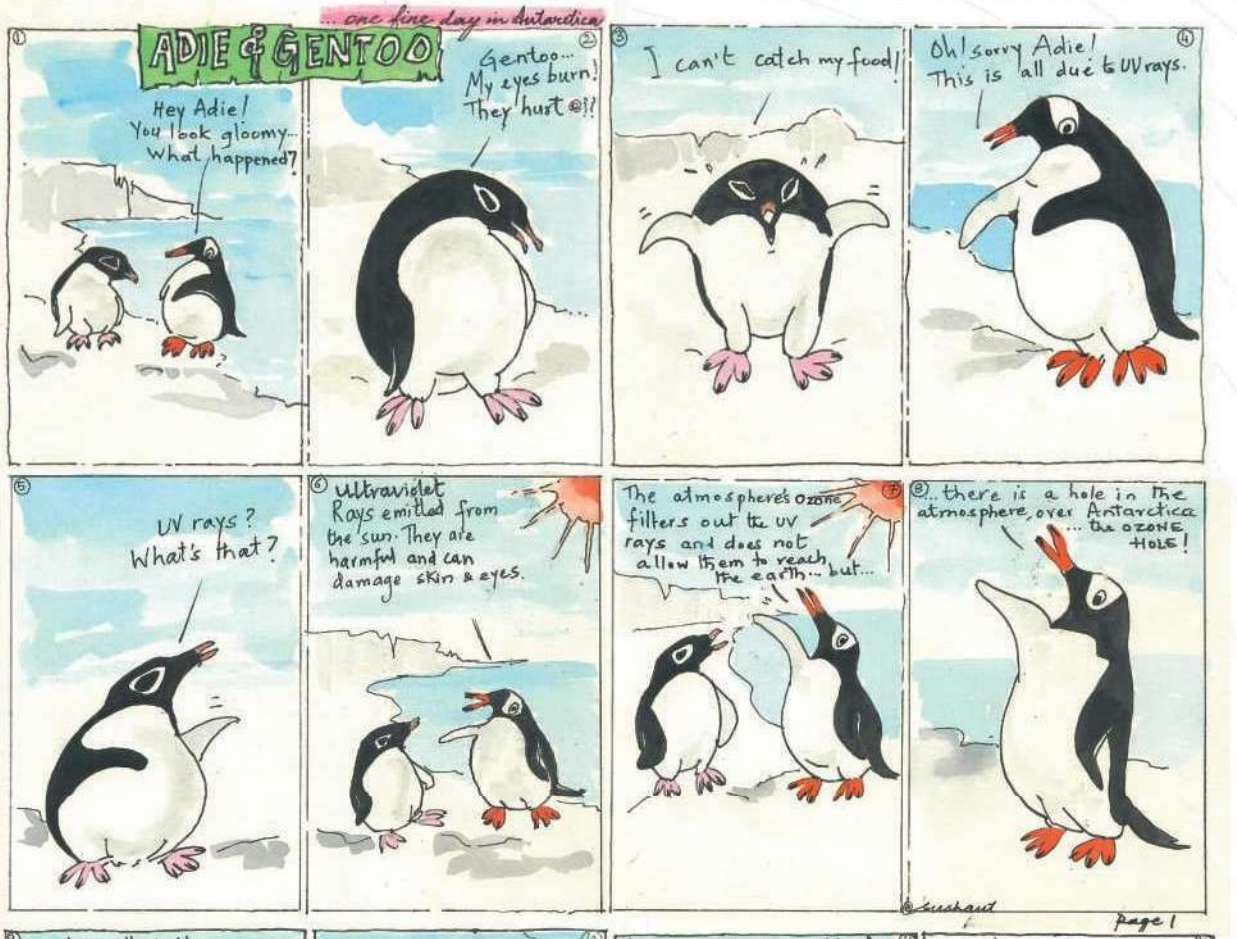
Happenings in the Sub-continent

SCIENCE!

CARTOONS

Dr. Sushant Suresh Naik
Principal Scientist
Geological Oceanography Division
CSIR-National Institute of Oceanography
Dona Paula, Goa 403004

To join QuatChron -AOQR Google Group:
Open https://groups.google.com, login (using Gmail account), search for "QuatChron_AOQR" and ask to join.]



QUATERNARY RESEARCHERS

Quaternary Chronicles

Happenings in the Sub-continent

Quaternary Chronicle (QC) publishes three issues a year seeks to publish perspectives, recently published peer-reviewed papers in Quaternary science, new developments in Quaternary science methods/ techniques, past events, awards, abstracts of recently awarded Ph.D./MS thesis; Quaternary publications, obituaries and details on forthcoming conferences/opportunities/fellowships the world over. Each issue of the newsletter will therefore, comprise news on on/from the Indian sub-continent;. It will also have a platform for discussion on emerging questions and ideas in Quaternary science and details on new books/ monographs/ reviews. QC seeks to share original results, new ideas and innovative development for the common good and a possibility to serve as a catalyst for the initiations of major and coordinated initiatives in the country.

We now accept submissions for our upcoming issues. Submit all the contributions to ***aoqr2019@gmail.com****. Themes for contributions are given below:*

1.Perspective: *Perspective write-ups on emerging trends and new possibilities in Quaternary Science (500 words).*

2.Sneak-peek and Discussion: *Share any exciting findings/questions from your ongoing (unpublished) work already to facilitate discussion. Any other intriguing facts/ unanswered questions are also welcomed for discussion (150 words).*

3.Significant new manuscripts/ books/ monographs/ reviews: *Corresponding authors of recently published peer-reviewed papers are invited to submit a brief summary of their work (not published abstract) with complete reference, web-link, and corresponding email address (200-300 words). Also, include a PDF copy of the paper in the email (for reference only).*

4.Facilities and Instruments: *A list of available facilities at various Indian institutes will be given and updated as contributions are received. In-charge of the available facilities, mentioning whether it is open access or available on payment basis, may submit the details with contact details.*

5. Achievements: *Share national or international awards/ fellowships/ recognitions with the larger Quaternary community. Also, approved SERB/ DST/CSIR/ national/ international Quaternary projects with the title, affiliation details of the awardee and a brief abstract (200 words) may be submitted with a copy of the award letter (for reference only).*

6.Projects/Collaborations: *New projects and collaborations related to Quaternary Science may also be sought for enhancing the quality of ongoing/proposed research. Submit a brief summary of the project, collaborations required and the contact details for correspondence (200 words).*

7. New Thesis: *Abstracts of awarded PhD/MS degree are invited for contribution (250 words).*

8.Opportunities: *Submit details with web-link of any new openings and opportunities for wider circulation.*

9. Social media: *Follow, discuss and share Quaternary India News on https://twitter.com/ AOQRIndia (Twitter) and https://www.facebook.com/ AOQRIndia (Facebook).*

Come join us!

The Association of Quaternary Researchers (AOQR) invites you to register for AOQR Membership and ask your colleagues and students to make the AOQR Fraternity stronger and become a part of the AOQR family.
See the details in https://www.aoqr.org/#

ISSUES	Deadlines (Last date for submission)
Issue -1 (April)	**March 10**
Issue -2 (August)	**July 10**
Issue -3 (December)	**November 10**

M/S ASSOCIATION OF QUATERNARY RESEARCHERS
53 , BIRBAL SAHNI INSTITUTE OF PALAEOSCIENCES
UNIVERSITY ROAD , LUCKNOW U.P

Balance Sheet As on 31st March 2024

LIABILITIES		AMOUNTS Rs. P.	ASSETS	AMOUNTS Rs. P.
Capital Fund			**Current Assets, Loans & Advances**	
Opening Balance	452308.16			
Members Fee	53000.00		Bank Balance	387504.32
Less: Exps.over Income	-117803.84	387504.32		
Total		**387504.32**	**Total**	**387504.32**

For ASSOCIATION OF QUATERNARY RESEARCHERS

For Navdeep Maheshwari & Associates
Chartered Accountants

Navdeep Maheshwari
(Proprietor)
M.No.:419269

Navdeep Maheshwari Chartered Accountants Membership No. 419269 AMROHA

President

ASSOCIATION OF QUATERNARY RESEARCHERS Lucknow

Seceratory

Place: Amroha
Date: 21/06/2024

M/S ASSOCIATION OF QUATERNARY RESEARCHERS
53 , BIRBAL SAHNI INSTITUTE OF PALAEOSCIENCES
UNIVERSITY ROAD , LUCKNOW U.P

Receipts & Payment account for the year ending on 31/03/2024

PARTICULARS		AMOUNTS Rs. P.		PARTICULARS		AMOUNTS Rs. P.
To Opening Balance			By	Expenses On AOQR		109292.00
Cash	0.00		By	Proffessional fee		8500.00
Bank	452,308.16	452308.16	By	Bank Exps		11.84
To Donation Received		0.00	By	Closing Balance		
To MmbershipFees		53000.00		Cash	0.00	
				Bank	387,504.32	387504.32
		505308.16				**117803.84**

Income & Expenditure account for the year ending on 31/03/2024

To Bank Expenses on AOQR		11.84	By Excess of Expenses over Income	117803.84
To Expenses Others		109292.00		
Conference support Exps	50000			
Printing News Letters	5546			
Website Maintenance Exp	49796			
Mail merge Google Add-c	3950			
To Proffessional fee		8500.00		
Total		**117803.84**	**Total**	**117803.84**

For Navdeep Maheshwari & Associates
Chartered Accountants

Navdeep Maheshwari
(Proprietor)
M.No.:419269

Place: Amroha
Date: 21/06/2024

Navdeep Maheshwari Chartered Accountants * AMROHA * Membership No. 419269

For ASSOCIATION OF QUATERNARY RESEARCHERS

President **Secretary**

ASSOCIATION OF QUATERNARY RESEARCHERS * Lucknow *