ASSOCIATION OF QUATERNARY RESEARCHERS

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2021-2022

Annual Report

Association of Quaternary Researchers (AOQR)

Address - Birbal Sahni Institute of Palaeosciences,
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Vol.3 No.1 April 2021

From the Secretary's Desk

Dear Quaternary Enthusiasts,

On behalf of the President AOQR, I am happy to present the efforts of the AOQR-ECR team in the form of Volume 3 Issue 1 of the Quaternary Chronicles. I sincerely hope 2021 is the year of successful activities for all of us. In the last four months there were a series of activities conducted by the Association. We celebrated the first foundation day of the AOQR on the 12th of December 2020, having lectures delivered by Professor Thijs van Kolfschoten, President, INQUA, and Dr. Marie-France Loutre, Executive Director, PAGES - Past Global Changes. One of the objectives of AOQR is establishing a link between the global Quaternary community with us, hence there has been a constant effort to introduce global activities to our Researchers in India. Hence all this was planned accordingly and effectively. Professor A.K. Singhvi presided over this meet. The Governing Body of AOQR has several activities planned for this year too. We began with the bimonthly 'Legends web talk series', and in the month of January 2021 two legends, Prof. William Martin and Prof. Victor Baker interacted with the AOQR fraternity. The videos of their talks are available on our website (www.aoqr.org), in case someone missed joining us. Due to some unavoidable circumstances we could not conduct the talks scheduled in February, which were of Prof. Peter D. Clift and Prof. Robert Wasson. However as soon as we have the appropriate opportunity, we shall reschedule and hear them share their knowledge and experiences.

I thank all the members who have registered with the AOQR. The list is gradually increasing everyday and our family is growing (81 registered members till date), which makes me feel very elated. I earnestly request you to visit www.aoqr.org and see the announcements and the videos of the talks. Members can start panel and group discussions if needed, after registering from their registered logins of AOQR. It is a facility for paid members, so please utilise it to the fullest. AOQR is your platform, it's an association for linking us all together, learning and sharing together, and in unity lies the true strength of our association. We want to start a student webinar series and welcome proposals for it.

A virtual national training of Quaternary Palynology was conducted jointly with BSIP, Lucknow, from 22-24 February, 2021. It was a ten-hour training module with lectures on the applications, field collection and case studies, and video demonstrations of the maceration and microscopy techniques by our Quaternary Palynologists. The training was attended by 62 participants from 33 institutes and universities of India. I thank all the experts for their valuable time and for a successful conduction of the meeting. I was emotional to learn from a few participants that they had seen the high end microscopes for the first time in the video demos during the training. I wish we could do offline training soon, on a larger scale, and the national facilities of various labs of the country can be available to researchers for their studies.

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Do read the detailed report of the training in this newsletter and the feedback from few of our participants.

AOQR is planning a webinar series for postgraduate (Masters and Doctorate) students of the Quaternary sciences, to promote their research. Our working groups have been formed and this year we will also work on strengthening these individual groups. I request our members to come forward, and help and support AOQR accomplish this goal.

At the end, we pay homage to one of the Indian stalwarts of Geology and one of the finest Sedimentologists of his time, Professor I.B. Singh, Department of Geology, University of Lucknow. His immense work in the field of Quaternary Sciences will always be remembered.

With this brief summary on the AOQR its activities and future plans, on behalf of our President, the AOQR, our ECR team and my own, I wish you a happy and a successful spring and summer. We will come with our Volume 3, issue no 2 of the newsletter on 1st August.

I hope you enjoy reading this volume of Quaternary Chronicles. Stay connected and do share your findings with us so that we can publish them in the next issue.

- Binita Phartiyal
Secretary, AOQR

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PERSPECTIVES

Anjum Farooqui
Scientist F
BSIP, Lucknow

The present trend of Climate Warming is globally perceived as the cause for an increased risk of severe extreme climatic events. The consequence of rise in global temperature is likely to increase glacial melts and sea levels. Subsequently, the oceanic temperatures and its reaction with the biotic and biogeochemical domain is understood by researchers to play a dynamic role in maintaining biodiversity. The Indian subcontinent has an extensive coastline, from the west to the east, which makes it vulnerable to climate-induced sea-level changes. Terrestrial vegetation along the coastal margins have a dominant role in atmospheric gaseous exchange. This vegetation cover helps in several ways to mitigate the challenges of increased atmospheric greenhouse gases; may it be natural or anthropogenically enhanced, particularly due to fossil fuel burning.

The knowledge of the South West Monsoon periodicity due to solar forcings has a socio-economic impact and is often linked to the future challenges of global climate change and biodiversity. The past monsoonal records from sedimentary archives have become a surprisingly useful guide for understanding present vegetational behaviour and predicting future trends. The variability in the Indian Summer Monsoon (ISM) also relates to the global climate circulation pattern. In recent years, the long-term variation of seasonal to decadal scale rainfall over the Indian sub-continent has been studied, indicating uncertainties in monsoon variability along with a significant decreasing trend. The southern Western Ghats and Sri Lanka are globally recognised as one of the eight 'hot spots' of biodiversity and are a gateway to the ISM. Climate monitoring through different proxy-records is important for understanding the future challenges as the Earth is likely to become warmer in the future.

The implications of palynological data-sets in climatic interpretations are still less understood and vary with respect to depth, chronology and altitude of the sedimentary archives. The climatic variability involves both internal and external forcing mechanisms. The gradation/changes in the effects of solar intensity, and the dynamic teleconnections of oceanic water circulation and sea surface temperature are the fundamental processes that interplay between mid to high latitudes and are responsible for climatic variations. The emergence of the rainforest ecosystem and its diversification started in the Late Cretaceous and Early Palaeogene during the movement of the Indian Plate from the southern to the mid-latitudes, in response to changes in the global climate pattern. However, the Quaternary period witnessed the most dynamic climatic conditions that created situations in which extinction, migration and introduction of plants defined the present set-up of climate-vegetation relationship that we see in the present in varied geographical settings. This time scale exhibits a dramatic biogeographic shift in vegetation which was forced by climatic instability. It has been seen that the diversity of trees is the highest in those tropical regions where climate has varied the least during various geological periods and the lowest in those areas where tropical forests were most disrupted by the cyclical revolutions of climate. The southern Western Ghats is a home to endemic rainforest diversity. Repeated cycles of glacial and interglacial conditions during the Quaternary period largely affected the vegetation globally and in India, which is recorded through palynological studies of the sedimentary archives. The primary source of vegetation evidences are fossil pollen records preserved in natural archives. It has been recorded that the present day endemic flora in the south-western Ghats of India is the legacy of Palaeogene/Neogene flora that survived as 'refugia' during Quaternary glacial periods. During these periods, the process of migration and colonization of the vegetation and its sustenance, eventually led to several species extinctions or additions. There is a wide gap in the knowledge of vegetational changes that might have occurred during the Quaternary period. Pleistocene glacial/interglacial sedimentary deposits in the marine and terrestrial realm in the Indian sub-continent depicting vegetation status are rare, which do not provide complete answers to their lineage and relationship with climate change through time. With reference to the peninsular part of India, a drastic economic loss and coastal instability is foreseen due to climate warming. Future vulnerability may not depend directly on climate change but also on the development plans and strategies pursued in the present day. Thus, studies related to palaeo-vegetation, palaeoclimate and paleoecology, palaeogeography etc. needs to be implemented in the context of national and global sustainable development efforts. AOQR is yet another step forward to join and enlighten the quest and progress of Quaternary researchers in order to take the right and appropriate measures to reduce the vulnerability and negative effects of climate change.

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Archaeology, in India, is classified as a discipline falling within the 'humanities' and thus standing somewhere outside the realm of the 'sciences', even though such a distinction has long outlived its use. These artificial boundaries no longer exist in research projects or in literature that seeks a united approach in addressing 'big' questions of global interest concerning the story of human evolution. Such multiple interfaces between archaeology and a range of other Quaternary sciences have been enriching Indian archaeology ever since the discovery and study of Indian prehistory was initiated by R.B. Foote in the 19th century. Over the last few decades, studies in prehistory and protohistory have moved from stratigraphic reconstructions and simplistic correlations to the inclusion of complexities arising from behavioural variability through time and interactions between hominins and their ecological niches. In addition to ecological approaches in Indian prehistory, new conceptual and methodological approaches for evaluating data and interpreting past hominin behaviour have also flourished, with artefact assemblages situated at the intersection between past environmental dynamics and cognitive controls.

There is thus a growing potential for building greater collaborative networks between archaeologists and other 'palaeo' scientists when human-related issues are in the spotlight. This comes with an urgent need for a deeper understanding among scientists of the theoretical and methodological concepts involved in diverse collaborating disciplines. This arises particularly when attempting to explain past behaviour in relation to palaeoenvironmental changes, without falling into the trap of either environmental determinism or tokenistic conclusions. Archaeology as a discipline is endowed with powerful explanatory frameworks that can deliver reproducible results with robust hypothesis-testing protocols. Strengthening these frameworks requires a conscious effort to unite the multiple sciences that document the Quaternary.

In our own investigations in SE India, with long-term ongoing research at Attirampakkam and other sites, we have attempted to steadily expand our team of Quaternary scientists. Pulling together conclusions from different specialisms is part of a complex adventure of evaluating and testing models of past human adaptation in changing environments. This thrives on constant dialogue and communication in order to understand and grow from each other's skills and knowledge. It delivers exciting results, opening up at every step the need to collaborate with other specialists and expand our knowledge of the past. On another level, we have sought to reach out to children, university students and scholars through workshops, programs, lectures and skill-development modules, uniting disciplines in a common framework for understanding the past. During this year of pandemic-related lockdowns, our Down Ancient Trails forum has moved online: encompassing 'palaeo' scientists as well as children and teachers in an attempt to build bridges between diverse groups.

In that context, AOQR is a key forum for initiating dialogue and sharing research strategies aimed at working within the broad framework of Quaternary studies.

Professor Shanti Pappu
Sharma Centre for Heritage Education
Chennai, India

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Keeping in mind the limitation of this text, I like to highlight only a few vital aspects of the Holocene climate of the Indian Himalaya (Indian Summer Monsoon (ISM) vs. Indian Winter Monsoon (IWM)), models which indicate large variations in precipitation but little deviation in temperature. Projections of future climate show large uncertainties, due to unknown reasons of certain abrupt events and different impacts of changes in the past monsoonal intensity. The question of what caused these abrupt and minor pulses is of direct relevance to global climate modeling and a prerequisite is to construct precisely dated, very high resolution records to identify extreme climatic events, especially in the last few thousand years - a time bracket which is directly related to modern civilization and culture.

We all are aware that the drivers of the Westerlies have received much less attention than the Indian Summer Monsoon (ISM), especially in the Himalaya where the Westerlies contribute a considerable amount of the total annual rainfall. Therefore, to comprehend Himalayan climate dynamics better, several researchers now are widely discussing the significant role of the Westerlies in the Himalayan palaeoclimate. Attracted by such recent works, a research group has renamed the Westerlies as the Indian Winter Monsoon (IWM) with the title of an article as "Indian Winter Monsoon: Past and Present" (ESR, 2016, 163: 297-322). It is also proposed that the IWM produced winter crop failure may have been responsible for the gradual demise of the Harappan civilization, which is in contrast to the speculation that it was diminished due to neotectonics or seismic activity. Further, the first complete tree-ring-based precipitation record of the past decades from the NW Himalaya (Sci. Reports, 2017, 7(1): 1-8) indicates an increase in winter and spring precipitation, augmenting the growth of glaciers in the Jammu and Kashmir, and Karakoram regions, which is in contrast to the behavior of glaciers in the adjacent states, where most glaciers have been waning at a fast rate. At the moment, however, a major concern seems to be the quantification of the ISM and IWM during the Holocene period, although a recent work (ESR, 2021, 212: 103431) has successfully tried the D-excess parameter in the lake deposits to crack this puzzle.

Because of the contributions of both the ISM and IWM in the Indian Himalaya, exceptional conclusions are drawn for the Upper Holocene, e.g., a wetter/warmer Little Ice Age (LIA) with very high precipitation in the western Himalaya in contrast to Peninsular India where the ISM had declined during this time. It is proved that conditions were warmer and drier during the preceding Medieval Climate Anomaly (MCA) and also in the post-LIA periods, as evidenced by high resolution speleothem research. During the LIA, a weaker ISM brought drought conditions to the core ISM area but triggered more monsoon 'breaks' that brought higher precipitation to the Himalaya. This makes us seriously believe that the so-called global events are never synchronous and their initiation and termination must be different in the regimes of different precipitations. Despite dedicated efforts, a comprehensive quantification of the ISM and IWM for the Indian Himalaya has been elusive, especially on the time scales relevant to the society. Absence of quantitative, high resolution (multi-annual to decadal) records, and the complexity and multiplicity of factors influencing the monsoon have hindered the efforts to understand their independent behavior. This issue needs to be addressed because any changes in the nature of the influencing factors or the magnitude of their impact are critical for land-use planning etc. In order to better understand the extreme climatic events in the Himalaya, especially during the MCA and LIA, we need to develop very high-resolution records by using precise archives and specific proxies. I foresee tomorrow's time as "palaeo-weather changes" and not the "palaeo-climatic changes" in the climate history.

With AOQR as a national association working for the betterment of Quaternary Science in the Indian subcontinent, I am sure very high-resolution records using precise archives and specific proxies will be achieved when like minded researchers will work hand in hand for a common goal. I thank Dr. Binita Phartiyal, the Secretary of this association for having invited me to write for the Quaternary Chronicle Perspective column and I wish AOQR success in fulfilling their objectives.

Dr. B S Kotlia, *Kumaun University, Nainital*

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Dr. Trina Bose,
ECR-AOQR,
Scientist,
BSIP, Lucknow

The knowledge of past climatic variations or Paleo data is very significant for a better comprehension of natural patterns in the Earth system, which has become especially important during the present time of anthropogenic climate change. They describe the interconnections of the Earth's abiotic components and the biotic processes unique to this planet through billions of years. This interplay is reflected in the methods of extracting paleo information, i.e., archives, proxies, and techniques.

Among all the paleoclimatic proxies, tree ring data have the most stable resolution, i.e. its resolution does not change with the sample's age. The reconstructed climate variability from tree ring width using statistical techniques shows a 40-50% correlation with the instrumentally observed data. Ring width data have a measurement error (being a physical measurement) of ~10% (due to the least count of ~0.01 mm). These error levels can be further improved using isotopic measurements of tree ring cellulose which has a maximum measurement error of <1% (normal measured value >10‰ and normal error values 0.1‰). Statistical analysis, though, produces about the same level of correlation, even using more accurate isotopic proxies. However, cellulose isotope analysis has the advantage that the physiochemical process of cellulose formation and isotopic fractionation can be modelled by experimentation on live trees.

The cellulose molecule has three elements: carbon, oxygen and hydrogen, sourced from atmospheric carbon dioxide and soil water. The oxygen in carbon dioxide is released back into the atmosphere. Hence, there are two sets of processes involved in the formation of cellulose: (1) the travel of hydrogen and oxygen as water from the root to the leaves and the biochemical processes of sugar and cellulose formation and deposition, and (2) the incorporation of carbon from the atmosphere into leaves for carboxylation and subsequent deposition in the trunk as cellulose. The former process using both oxygen and hydrogen isotope values can reconstruct temperature and humidity information. The latter can combine the resultant temperature and humidity information with the carbon isotope values to yield atmospheric carbon dioxide levels. Therefore, these reconstructions being mechanistic, can extend the instrumental data backwards on annual or better time resolutions with inherent mathematical error and dependability analysis.

The above process can also calculate cumulative effects in long-term sediments by combining annual tree ring cellulose isotope values from nearby sites with cellulose isotope values of sediments of longer time-resolution (say in centennial scales). These can then be extended to the other sediment proxies. The paragraphs discuss only one type of analysis ensuing from the interplay of various components in the Earth system. However, these kinds of analysis require interactions between all kinds of Quaternary scientists, which become even more important for the complex situation of the Indian subcontinent containing nearly all relevant Earth processes often in combination. Given this, the establishment of the Association of Quaternary Researchers (AOQR) is an essential component of Earth system analysis in the subcontinent, enabling people working in widely separated streams to combine their knowledge to better understand Quaternary science processes.

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First Foundation Day Celebrations

The first Foundation Day of AOQR was celebrated on a virtual platform on December 12, 2020, Professor Thijs van Kolfschoten, President, INQUA, was the Guest of Honor and Dr. Marie-France Loutre, Executive Director, PAGES - Past Global Changes, was the Chief Guest. Professor Ashok Singhvi presided over the function.

Welcome Address:
Dr. Vandana Prasad, President, AOQR
About AOQR:
Dr. Binita Phartiyal, Secretary, AOQR
Foundation Day talk 1:
Professor Thijs van Kolfschoten, President, INQUA
Foundation Day talk 2:
Dr. Marie-France Loutre, Executive Director, PAGES
Address by the Presiding Officer:
Prof. Ashok Singhvi, Honorary Member, AOQR
Vote of Thanks:
Dr. Pradeep Srivastava, Vice-President, AOQR

Past Events: Legend's Talk - A bimonthly webtalk series

"WHEN THE SAHARA WAS GREEN" BY MARTIN WILLIAMS

The Sahara is our largest hot desert. Driving across the Sahara is like being on the moon. Not a blade of grass. Nothing but sand, wind, dust. Present aridity contrasts with evidence that the Sahara was once a green and pleasant land. Rock paintings and engravings of elephants, giraffes, rhinos and scenes of cattle herding are common on sheltered rock outcrops throughout the desert. When and why was the Sahara once green? When and why did it become dry? Did humans cause the Sahara to become a desert? This talk will seek to answer these questions.

ABOUT THE SPEAKER: Martin Williams has always been fascinated by desert landscapes. He has travelled widely in many parts of the Sahara and has worked with international teams of archaeologists and geologists in some of the remoter parts of that vast desert. His more recent books include Climate Change in Deserts (CUP, 2014), Nile Waters and Saharan Sands (Springer, 2016) and The Nile Basin (CUP, 2019). His latest book When the Sahara was Green: The story of our greatest desert is written for non-specialist readers. It will be published this year by Princeton University Press. He is Professor Emeritus and Adjunct Professor in Earth Sciences at the University of Adelaide, Australia.

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Bimonthly Talks 2021

LEGEND'S TALK

18 January 2021
11:30 AM IST
4:30 PM Adelaide time

https://meet.google.com/imj-aogn-vbj

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LEGEND'S TALK

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Bimonthly Talks 2021

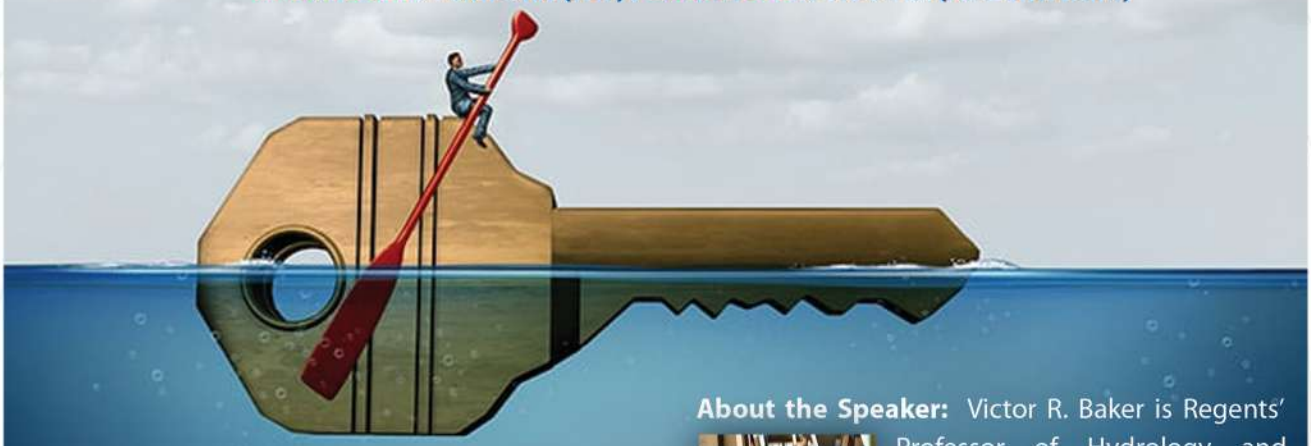
Discovering Possible Futures in the Past:
Quaternary Paleofloods and the Prevention of Natural Disasters

by

Victor R. Baker

Regents Professor of Hydrology and Atmopheric Science, The University of Arizona

29 Jan 2021: 10:00 AM (IST) / 28 Jan 2021: 9:30 PM (Arizona time)



Abstract: Though the science of paleoflood hydrology (PFH) was not formally named until 1982, its origins trace back a century or more, notably to geological studies of the largest freshwater floods ever to have occured on Earth. During the 1970s paleoflood studies evolved to provide practical applications by combining aspects of Quaternary geomorphology and stratigraphy with quantitative physical analyses of flood hydrology and hydraulics. Beginning in the 1980s important early PFH work was done in the Narmada Basin and other areas of India. PFH methdologies have now been adopted internat- ionally, forming part of standard engineering approaches to evaluating extreme flood risk in the U.S., the U.K., China, Australia, and other nations. Because extreme phenomena are associated with very long time scales, it absolutely essential to investigate natural recordings that occur in landforms and sediments in order to understand the kinds of extreme flood phenomena that pose the greatest high-risk hazards to humankind. Fortunately nature is surprisingly effective in preserving paleoflood records of such extreme phenomena, with the result that evidences of past flood occurrences provide the most effective insights to future extreme flood possibilites. **It is a matter of certainty that what has happened can happen.**

About the Speaker: Victor R. Baker is Regents' Professor of Hydrology and Atmospheric Sciences, Geosciences, and Planetary Sciences, University of Arizona. Baker has authored or co-authored more than 1100 scientific contributions, including 20 books, 443 research articles and chapters, more than 550 abstracts and short research reports, 34 extended technical reports; 42 encyclopedia articles; 39 published book reviews; plus guidebook contributions and various other writings, including popular works in science. His research has concerned paleoflood hydrology (a field of study that he defined in the 1970s and 1980s); flood geomorphology; channels, valleys, and geomorphic features on Mars and Venus; catastrophic Pleistocene megaflooding in the northwestern U.S. and central Asia; history/philosophy of Earth and planetary sciences; and the interface of environmental science with public policy. His work on megafloods has been featured in multiple television documentaries for PBS, BBC, and the National Geographic, Discovery, and History Channels, including the 2005 NOVA production "Mystery of the Megaflood" and the 2017 NOVA production "Volatile Earth" episode on "Killer Floods."

Future Events: Legend's Talk - A bimonthly webtalk series

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Announcements:
AOQR Student Colloquium

The AOQR, on the back of the successful ECR webinar series, is planning a colloquium of six hours, spread over two days for postgraduate (Masters and Doctorate) students of the Quaternary sciences, to promote their research, as well as get insights from a wide range of participants - fellow students, ECRs, faculty members, and established stalwarts of the field. Interested students are invited to submit an abstract of their proposed talk, along with a short CV, to aoqr2019@gmail.com with the subject AOQR Student Colloquium. Selected students will be invited to present their work virtually, tentatively planned for June/July 2021.

Ph.D's Awarded

AOQR congratulates Dr. Navya Reghu, Dr. Vikram Singh, Dr. Riyanka Avijit Talukdar and Dr. Neha Joshi on the award of their Doctoral degree!!
Congratulations!!

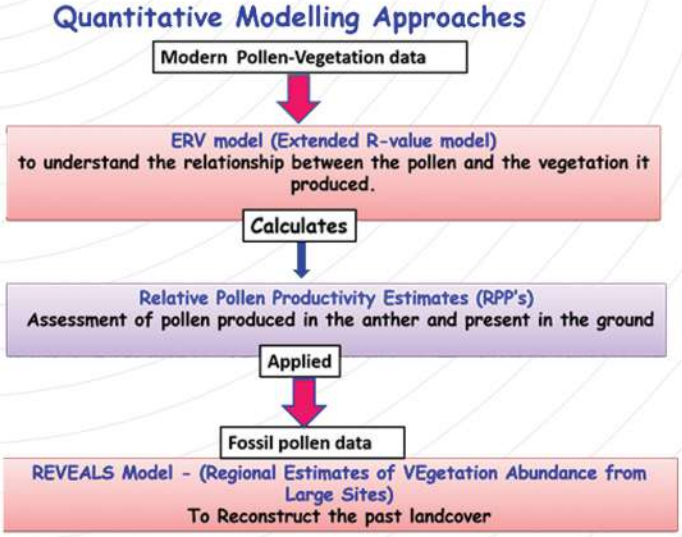
1. Thesis Title: Pollen based estimates of Holocene vegetation in southern India: An LRA (Landcover Reconstruction Algorithm) approach.

Navya Reghu, French Institute of Pondicherry, Pondicherry, India
Supervisor: Dr. Anupama Krishnamurthy, Laboratory of Palynology & Paleoecology, French Institute of Pondicherry, Pondicherry, India.

This doctoral thesis aims to reconstruct the past land cover in south India using quantitative models in a tropical context using pollen. The main focus was to understand the pollen and vegetation relationship through a quantitative modelling approach, developed and established by Sugita (2007a, 2007b) and to apply this information to the fossil sediment records retrieved from the south-east (SE) (Albizia amara zone) part of India. The approach is basically new to India, which involves a standardized vegetation survey protocol (Bunting et al., 2013), Crackles Vegetation survey protocol, pollen-vegetation relationship modelling approach, Extended R-Value modelling (ERV) (Parsons and Prentice, 1981; Sugita, 1994) and REVEALS model (Regional Estimates of VEgetation Abundance from Large Sites) to quantitatively reconstruct past regional landcover. Effectively, the translation of pollen percentages through time into quantitative percentages of landcover of tropical south India is attempted. The conventional but qualitative approach of reconstructing past vegetation changes is also evaluated using a Holocene sediment record from the south west (SW) study region which was retrieved from the Cullenia-Mesua-Palaquium vegetation type of the Western Ghats. These pollen records were later compared with the pollen records from the drier SE India to assess qualitatively the past heterogeneity of vegetation in the distinct biogeographic zones, in terms of factors such as climate, monsoon and human impacts.

References:

1. Bunting, M. J., Farrell, M., Broström, A., Hjelle, K. L., Mazier, F., Middleton, R. and Twiddle, C. L. 2013. Quaternary Science Reviews, 82, 41–55. doi:10.1016/j.quascirev.2013.10.006
2. Parsons, R.W. and Prentice, I. C. 1981. Review of Palaeobotany and Palynology, 32(2), 127-152.
3. Sugita, S. 1994. Journal of Ecology 82, 881-897.
4. Sugita, S. 2007a. The Holocene 17, 229-241.
5. Sugita, S. 2007b. The Holocene 17, 243-257.



Research framework of the thesis to explore the potential and limitations of the quantitative modelling approach, i.e., REVEALS model and to provide practical and realistic assessment of the model for real application.

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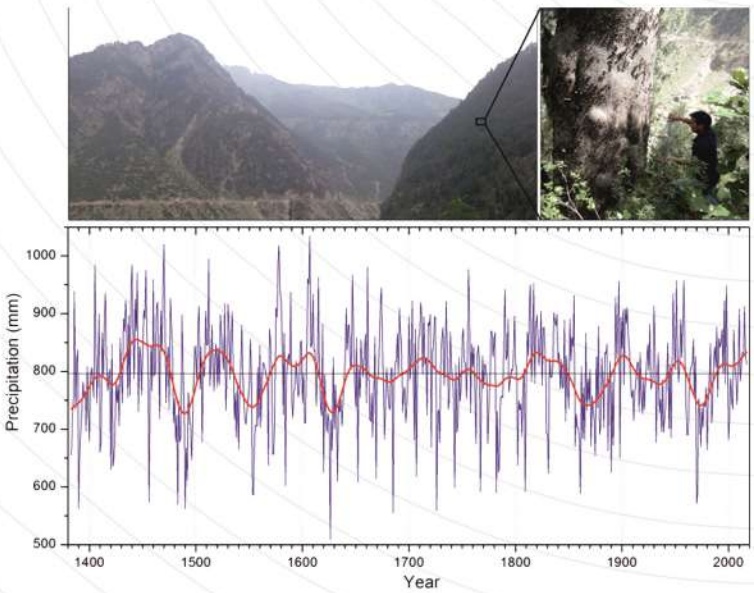
2. Thesis Title: Tree-Ring based climate cariability in Jammu and Kashmir since little Ice Age

Vikram Singh, BSIP Lucknow
Supervisor (s): Prof. A. D. Singh, Dept. of Geology, BHU, Varanasi; Dr. K. G. Misra, BSIP, Lucknow & Dr. R. R. Yadav, WIHG, Dehradun

This thesis presents high-resolution long-term climate variability records over Jammu & Kashmir using a wide network of tree-ring chronologies. To achieve the proposed objectives of doctoral work long-living tree species such as Himalayan cedar and neoza pine, have been used for robust climate reconstruction from Kishtwar, Jammu & Kashmir. In this study, 635 years long precipitation record has been developed, the longest so far from Jammu & Kashmir, using sixteen tree-ring chronologies extends back to the AD 1383. The precipitation reconstruction shows three-distinct centennial-scale phases; 1383-1650s, 1650s-1850s and 1850s-2017.

During the early (1383-1650s) and late (1850s-2017) phases of reconstruction more turbulent climatic conditions were observed along with high magnitude droughts or low precipitation periods. However, the middle phase (1650s-1850s) reflects more stable condition where precipitation is found close to the long-term mean of the reconstruction. The middle phase with long-term stable precipitation advocates the Little Ice Age influence over the north-western Himalaya and while the high-magnitude drought periods recorded in early and late phases did not support the LIA influence during their respective times.



3. Thesis title: Tectonic Geomorphological Investigations and Chronology of Quaternary profile along the Kali-Sharda river system, Eastern Kumaun Himalaya, India

Riyanka Avijit Talukdar, ISR, Gandhinagar
Supervisors: Dr. Girish Ch. Kothyari and Prof. Charu C. Pant

The current research was carried out along the Kali river basin, in the Eastern Kumaun Himalayan region, from Tawaghat near MCT to Tanakpur near HFT, covering the major tributaries of the river along with the main Kali river channel. The main objectives of the study was to identify possible active structures within the Kali basins, using geomorphic analysis of landforms; identification of spatial variability of active deformation using Relative Index of Active Tectonics (RIAT) within the basin; estimation and determination of long-term uplift rates along major geological structure and identification of the provenance of the sediments deposited along the Kali River channel. The major reason to select this river was to study the tectonic deformation that cuts across all the major thrusts and faults of the Himalayan range starting from the THF to the HFT. Hence, any deformation along them will cause a notable change along the river section, giving us an idea about the tectonic, geomorphological, and Quaternary changes in the region.

A combined study was done which includes morphometric parameters, field study, OSL dating and geochemistry of samples for a better understanding. The major morphometric analysis that was carried out included Stream Length Gradient, Steepness Index, Hypsometric analysis, Asymmetry factor, Relative Index of Active Tectonics and Longitudinal profile for all the rivers in the entire Kali river basin and the results stated that the hinterland part of the basin is more active than the foreland part. The SL and Ks contour and anomaly map suggests that most of the part in-between the MCT and NAT are more active, as also corroborated by extant seismicity in the region. Along with this, Gradient Length Anomaly was also carried out, whose results of negative GLA magnitude are associated with uplift, whereas the positive values reflect subsidence and erosional activity in the area.

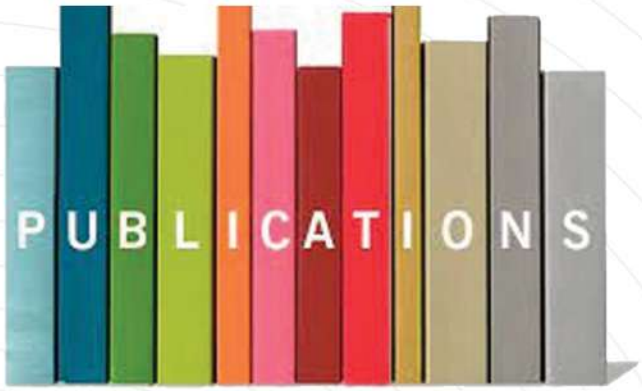
Four types of river terraces were found in this region, i.e. fill, debris flow, strath and paleo-channels, each of them indicating the contribution of climate and/or tectonicity for its formation. The OSL ages from the region suggest 4 major phases of aggradation during 18, 15, 9 and 7 ka, which led to the formation of the various fossil valleys and clogging along the channel. The Kali River was forced to occupy the present-day channel between 7 and 3 ka during the transitional climatic condition.

ples are mainly originated from the felsic (granite and granodiorite) sources,, with source rocks from the HHCS. The combined results of CIA and XRD suggests that between MCT and THF physical weathering is dominant, whereas intense chemical weathering in association with mechanical denudation is characteristic of the inner and outer lesser Himalayan domains. Further, based on geochemical data we argued that the terrace sediments collected from the different structural and topographic domains are significantly influenced by external (fluvial) processes and later modified by extreme climatic fluctuations.

4. Thesis Title: Paleo seismological and geomorphological evidences of neotectonic activity of Soan Dun, northwest Himachal Himalaya, India

Neha Joshi, ISR, Gandhinagar
Supervisors: Dr. Girish Ch. Kothyari and Prof. Charu C. Pant

Paleoseismology and archaeoseismology have played a significant role in understanding the earthquake occurrence in the active frontal part of the northwest Himalaya. For instance, historical records prior to instrumental data from Kashmir, Chamba, Kumaun-Garhwal and Nepal present occasions for some of the disastrous earthquakes in the history of the Himalayas. Considering the seismic hazard posed by the Himalayan Thrust systems, numerous paleoseismological studies are focussed in and around the Sub-Himalaya. In the present study, paleoseismological investigation is carried out along the back thrust of the HFT bounding the Janauri Anticline in the northwest frontal Himalaya. It is observed that for ~100 km length of BT it is an emergent as well as a blind thrust. Our findings complement three earthquake events from Palahta trench i.e. 535-1269 CE Event I, 1447-1636 CE Event II and 1660-1929 CE Event III to the previous records in this region. The present study is compared with the previous reported paleoseismic data which suggests that Event II identified coincides with the timing of more recent earthquake MRE at Hajipur, and Event I and Event III can be marked as independent events. Further, the combined data from the present and previous studies would assist in seismic hazard analysis and will aid in land use planning of the area.



Between January 2021 and March 2021, several novel research papers and book chapters incorporating wide scientific techniques were published in various national and international peer-reviewed journals. Some key highlights include:

Phartiyal et al. (2021) reconstruct climate variability of Ladakh on sub-century timescale spanning the last four millennia using a suite of physical, biotic and inorganic proxies of a lacustrine sequence. The authors suggest between ~4.1 to ~2.6 ka proxy records reveal climate variability following a typical pattern of the northern hemispheric climate and appear to be dominated by westerlies; and thereafter the Indian Summer Monsoon forcing appears to dominate regional climate.

Rawat et al. (2021) discuss the impact of climate variability on cultural changes in the Indian subcontinent, by reconstructing the high-resolution centennial to millennial scale middle Holocene Indian summer monsoon variability at the Bednikund lake, Central Himalaya. Increased ISM precipitations were found during the mid-Holocene climate optimum, Minoan Warm Period, Roman Warm Period, Medieval Climate Anomaly, and the Current Warm Period. Decreased ISM strengths were found during the Dark Ages Cold Period, and the Little Ice Age.

Singh et al. (2021) evaluate a network of tree-ring chronologies from moisture-stressed ecological settings in Jammu and Kashmir to identify the impact of Little Ice Age over the western Himalaya. Their study reflects three centennial phases

If you would like to describe a recent thesis on any aspect of the Quaternary sciences, either your own work or of any of your student's, and would like it to appear in the AOQR newsletter, do write to us on ***aoqr2019@gmail.com*** *with the subject PhD thesis, along with a short summary of the work, the name of the research scholar, supervisor(s) and their affiliations, and see it featured here! You can also send any images you would like to feature along with the description and summary of your work.*

and demonstrates the north-western Himalaya did not witness any LIA influence before 1650s.

Chaddha et al. (2021) survey a number of caves in the eastern part of Ladakh which contain archaeological traces of Transhumant occupation and apply an array of geoscientific methods to characterise the cave roof coatings. The authors hypothesize that the caves were used by the transhumant herder communities during the summer for grazing their livestock and by travellers during the long silk route journeys.

Devrani et al. (2021) assess the sediment mobilisation in the upper Ganga Basin through remote sensing, field observations and existing literature, in the Kedarnath and Srinagar valleys. Their results show that the evolution of translative, dispersive, and their combined sediment pulse pattern in both selected reaches of the upper Ganga Basin, and the authors recommend further detailed studies.

Dutt et al. (2021) present a study from the Mawmluh cave, northeastern India, which shows sudden shifts in speleothem oxygen isotope values, indicating several abrupt changes in the Indian summer monsoon during ~212 BCE to 1986 CE. Moderate ISM conditions prevailed during ~212 BCE to 400 CE punctuated with weak intervals, strong ISM during 400 and 500 CE and from 640 to 1060 CE, whereas weak ISM conditions prevailed during 520–540 CE, 820–850 CE and 940–980 CE, and after 1060 CE.

Kothyari et al. (2021) identify tectono-morphic features in a climatically induced and tectonically driven Himalayan system as the main focus of the present study. The parameters used for morphometric analysis. The field study exemplifies the presence of fault scarps, triangular facets, transverse faults, V-shaped valley, and folded Quaternary sediments. These tectono-morphic features suffice the sole purpose of this study and signifies the Holocene crustal deformation in the frontal sub-Himalayan zone of the Himachal segment.

Kumar et al. (2021)'s research deals with the health of the Chorabari glacier in Garhwal Himalaya between 1976 and 2017, using multi spectral and multi dated satellite data, and their investigation reveals that the studied glacier receding continuously, with an inconsistent rate, for the last 41 years, and the rate of receding dominates significantly after 2012.

Sood et al. (2021) propose an effective way of estimating the bi-temporal snow/ice changes especially over rugged terrains around the globe called subpixel-based change detection approach and present a study focussing on the snow and ice cover changes over the Chhota-Shigri glacier, Western Himalaya. The approach involves the integration of subpixel classification and change vector analysis to define the changes in the form of magnitude and direction between two multitemporal dates at the subpixel level.

Nag et al. (2021) synthesize geomorphic indices of active tectonics to understand the prevalence of neotectonic activity in the Ladakh area. Recurrent tectonic activity largely responding to the differential movement along this system of thrust fault is recorded at 50 ka, 35 ka and 21 ka (Last Glacial Maxima) through lower Greenlandian (~11 ka) to middle Northgrippian (~6 ka), while the climatically induced topographic changes are marked between ~13 and 12 ka.

Mohapatra et al. (2021) present palynological and other sedimentary records from the Cauvery Delta in the south-eastern peninsular India where the retreating north-east monsoon bringing the main rainfall is scarce. In the study, three major pollen zones are observed since 11.4 ka, which are presented and discussed, as are the methodological challenges of interpreting the vegetation record in such a dynamic and diverse environment (the delta plains of southern India).

Kothyari et al (2021) investigate the landforms in the central segment of the Northern Hill Range, which marks the surface expression of the Kachchh Mainland Fault, to understand the role of climatic changes and tectonic activity during the time of aggradation and incision. Conventional morphometric analyses indicate that the KMF is affected by tectonic activity in recent times. The study suggests that the deformation pattern close to KMF is the result of localized compressive stress generated between two fault segments.

Arulbalaji et al (2021) studied the late Quaternary dynamics of the southern Kerala coast based on satellite data, while the changes from the past century were extracted from the Digital Shoreline Analysis System. The evidence based on geomorphic variations suggest that the present study area hosts two distinct paleo-coastlines accreted during the Late Pleistocene and the Early-Middle Holocene.

Singh and Sinha (2021) present a planktic foraminiferal record from the Southeast Indian Ocean and propose that the Antarctic ice cap formation creates a positive feedback mechanism by lowering sea level, reduced strength of Leeuwin Current due to a decrease in the Indonesian Throughflow and less

heat supply towards the South Pole. All these phenomena add to further cooling.

Turvey et al. (2021) review available data for all putative extinct Indian megafaunal taxa with direct or indirect reported evidence of potential survival into the global "megafaunal extinction window" (from -50,000 years onwards) and suggest that there is sufficient evidence to recognise up to four genuine global megafaunal species-level extinctions in India during the Late Pleistocene: two proboscideans, a hippopotamus, and possibly a horse. A fifth extinct megafaunal species, the Indian aurochs, definitely persisted into the Holocene.

References

Arulbalaji, P., Banerji, U.S., Maya, K. and Padmalal, D., 2021. Quaternary International, 575, pp.270-279.

Chaddha, A.S., Mathews, R.P., Kumar, K., Ali, S.N., Phartiyal, B., Manoj, M.C. and Sharma, A., 2021. Journal of Archaeological Science: Reports, 36, p.102799.

Devrani, R., Singh, V., Mehta, M. and Ramanathan, A.L., 2021. Journal of the Geological Society of India, 97(1), pp.48-54.

Dutt, S., Gupta, A.K., Cheng, H., Clemens, S.C., Singh, R.K. and Tewari, V.C., 2021. Quaternary International, 571, pp.73-80.

Kothyari, G.C., Joshi, N., Thakur, M., Taloor, A.K. and Pathak, V., 2021. Quaternary Science Advances, 3, p.100017.

Kothyari, G.C., Kandregula, R.S., Chauhan, G., Desai, B.G., Taloor, A.K., Pathak, V., Swamy, K.V., Mishra, S. and Thakkar, M.G., 2021. Quaternary Science Advances, 3, p.100018.

Kumar, D., Singh, A.K. and Singh, D.S., 2021. Quaternary International, 575, pp.178-189.

Mohapatra, P.P., Stephen, A., Singh, P., Prasad, S. and Anupama, K., 2021. CATENA, 199, p.105029.

Nag, D., Phartiyal, B. and Joshi, M., 2021. Catena, 199, p.105103.

Phartiyal, B., Singh, R., Nag, D., Sharma, A., Agnihotri, R., Prasad, V., Yao, T., Karthick, B., Joshi, P., Gahlaud, S.K. and Thakur, B., 2021. Palaeogeography, Palaeoclimatology, Palaeoecology, 562, p.110142.

Rawat, V., Rawat, S., Srivastava, P., Negi, P.S., Prakasam, M. and Kotlia, B.S., 2021. Quaternary Science Reviews, 255, p.106825.

Singh, A.K. and Sinha, D.K., 2021. Journal of Climate Change, 7(1), pp.13-24.

Singh, V., Misra, K.G., Singh, A.D., Yadav, R.R. and Yadava, A.K., 2021. Geophysical Research Letters, p.e2020GL091298.

Sood, V., Gusain, H.S., Gupta, S., Taloor, A.K. and Singh, S., 2021. Quaternary International, 575, pp.204-212.

Turvey, S.T., Sathe, V., Crees, J.J., Jukar, A.M., Chakraborty, P. and Lister, A.M., 2021. Quaternary Science Reviews, 252, p.106740.

Report on the Palynology Training

Compiled by

Dr. Nivedita Mehrotra,

Women Scientist, WOS-A, D.S.T., BSIP. Lucknow

Details of Training Program

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A National virtual training program "Training on Quaternary Palynology" was organized by AOQR in association with the Birbal Sahni Institute of Palaeosciences, Lucknow, during February 22-24, 2021.

The training was coordinated by Dr. Binita Phartiyal and Dr. Santosh K Shah, both AOQR GB members and Scientists at BSIP. Experts were from BSIP Lucknow and the French Institute of Pondicherry, who gave the best of their efforts to help all the 62 participants from 33 Indian institutions (see figure) learn through the virtual platform in the first ever online training organized by them.

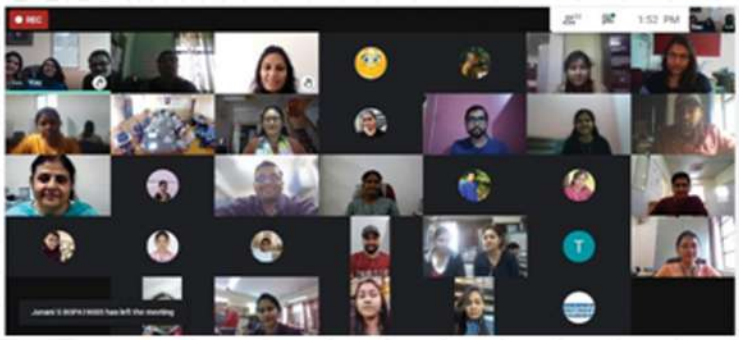
This virtual training constituted online lectures and practical demonstrations by expert palynologists in India. The training constituted a broad spectrum of topics related to palynological studies and practical training to the participants. Dr. Vandana Prasad, Director BSIP, Lucknow, and President, AOQR, formally opened the training session to the participants and the expert panel. This was followed by talks delivered on the applications of palynological studies with special reference to Mangrove forests and its significance in the past to explain paleoshoreline changes across different sites in the Indian subcontinent; basic sampling techniques involved in palynological investigations, elaborating on the equipments used, field techniques and sampling protocols for palynological investigations which are the first and primary requisites for any such studies; on pollen morphology for distinct pollen types yielded by various pollen producing plant types existing in the plant kingdom. The sample processing techniques were explained to the participants through recorded video lectures and demonstrations.

The step by step procedure of standard maceration techniques followed for palynological sample preparation were recorded and shown to the participants for a more lucid understanding of the same. Then the experts explained the application of palynological analysis through various case studies across India. In these lectures, experts explained the details of their findings, how significant their results were in understanding past changes in vegetation and climate during the Quaternary, and also the impact of various environmental factors and anthropogenic factors on these records. All these lectures were delivered by expert palynologists from BSIP

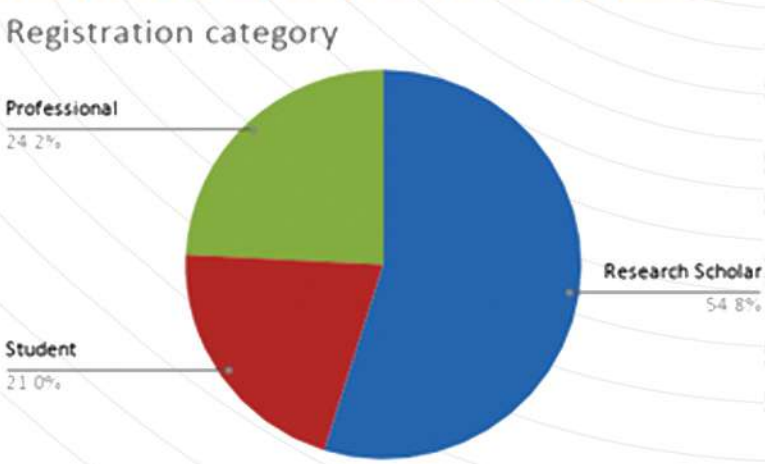
Lucknow and created much interest and excitement amongst the participants who responded through various questions and interest on the topics discussed.

There was also a detailed live demonstration of palynological samples observed under a light microscope and shown online to the participants with the support of Cilika Microscope/ MedPrime Technology Pvt. Ltd. India..This gave a hands-on experience of how palynological samples were observed to study the pollen preserved in them.There was also a video demonstration of the Light microscope, Scanning electron microscope and Confocal laser scanning microscope instruments at BSIP, Lucknow, used to study palynological samples and observe features and structures of various palynomorphs to perform advanced Quaternary palynological investigation.

A unique application of palynological data in forensic studies was shown and the participants were also briefed about the various statistical tools for modern and sub-surface pollen data. Reconstruction of past vegetations through pollen productivity estimates based on standard quantitative techniques and sampling protocols was explained by experts from the French Institute of Pondicherry.The session ended with a short online quiz for the participants.The participants answered religiously and with numbers of correct and swift answers by many of them.The training workshop was the first training organized by AOQR and was one of a kind in India. In these difficult times of COVID-19, AOQR has taken a step forward, especially for students and young researchers.This was organized to help them understand and benefit from a training given by some of the best known Quaternary Palynologists of India about the details and intricacies of palynological investigations carried out in the Quaternary sediments and its other applications.



AOQR looks forward to organizing many such trainings and events in the future and hopefully with an offline mode.



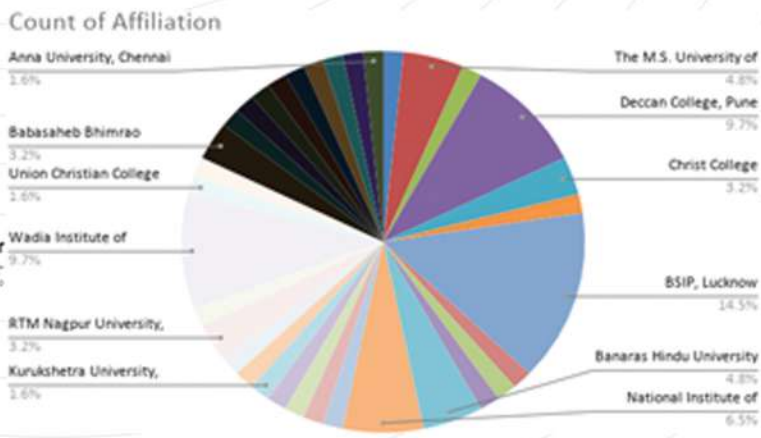


Fig. 1 & 2 Graphical Representation of the Category of Participants and their affiliations

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FEEDBACK

Dr. Bandana Samant, PG Department of Geology, RTM Nagpur University, Nagpur

Dear organizers and team of young and enthusiastic workers. Thanks a lot for organizing this wonderful training session. All resource persons were excellent, and they explained complex scientific topics in a simple way; and also explained nicely new developments in Quaternary palynology. Thanks a lot for organizing this programme which helped a lot in learning many new things. I feel that such programs should be organized regularly, both online as well as at the institute. This will generate interest in palynology among researchers and they will also come to know about the application of palynology in various types of studies. Thanks and congratulations to the organizers and the team. Looking forward to more such programs in the future.

Dr. Rajiv Saraswat, Micropaleontology Laboratory, Geological Oceanography Division, NIO, Goa

Dear Organisers and Resource Personnel, thank you very much for the very well thought out training program. We got a fairly good idea about the various palynological techniques.

Tishyarakshita Nagarkar, Pune University

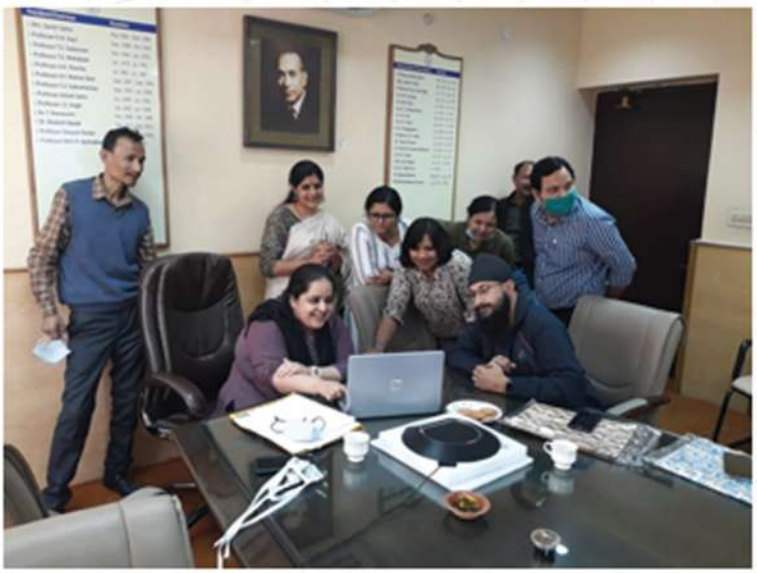
Each talk, presentation and demonstration took us to a different realm of the possibilities that Palynology possesses, what a tiny and often invisible through the naked eyes pollen grain or dust can tell us about the past is a fanciful stream. I am so fortunate and happy that I could be a part of this wonderful initiative. I somehow wished for the workshop to not end soon. The Expert Panel and the team of mentors of the august reputation explained each detail so well that even a novice participant and seeker like me could feel the joy of learning the exciting yet somewhat complex aspects of this mesmerising sphere of knowledge. My heartfelt thanks and gratitude to each of you! Will look forward to a continuous, rather perennial, source of learning from each of you. I also learnt a lot from the insightful questions from my fellow participants. Thanks to them as well. In unprecedented and challenging times like these, this three day long journey to understand our glorious past has been very very very beautiful. With anticipation for more and a brighter future prospect through these knowledge exchange courses I take my leave from here. Gratitude and regards.

Teema Joseph, PhD Scholar, Department Of Botany, Union Christian College, Aluva, Kerala

I would like to thank you for organizing an amazing training session. The training was very informative and very interesting. I particularly enjoyed the PPT presentations, which made the content easily understandable. I want to thank you and your team which was involved in the process of making this training session productive. You have all done a wonderful job. I will look forward to attending more training sessions with you, if possible. Congratulations all.

Vaishnavi A, Department of Geology, Banasthali Vidyapith

I am really very thankful to you for conducting such a wonderful event. It was like a new journey for me - like roaming in a completely new place, from being a non-bio to enjoy this beautiful aspect to gain something very interesting. Honestly it was really a great fun time for me along with a lot of new facts regarding pollen, their identification, techniques and so on which I haven't heard or studied yet. Please conduct many more events or workshops like this. It will be really fun if you could organise many more programmes related to geochemistry, geomorphology and climatology or more. Also I am very cherished with all your behaviour and interaction with all, it was like I am having interaction with my teachers. Thank you.
Thank you so much ..... I really loved it.



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A tribute to Prof. Indra Bir Singh

Prof. Indra Bir Singh, left for his heavenly abode on the morning of 11th February, 2021, at the age of 78. He is known not only as a pioneering scholar in Geosciences who helped bridging the gap between the theoretical complexities and practical implications of knowledge, but Professor I.B. Singh was an epitome of knowledge and virtues, who always went on to promote social responsibility in higher education. Remembered by his students as an ideal Guru, he retired as the Head and Dean from the University of Lucknow in 2005.

After working in premier Institutions of the world like the Technical University Stuttgart, Germany, the Senckenberg Institute, Oslo, and the Wilhelmshaven Institute, Germany, he returned to India in 1972, and joined the Department of Geology, University of Lucknow. He proposed new ideas that saw the remodeling of the conventional concepts in Geology, and worked on the sedimentary sequences of the Himalayas and Central India, ranging in age from the Precambrian to the Holocene. His main contribution is reflected in more than 200 research publications including Nature, with more than 10,000 citations, and range from themes such as the stratigraphy of the Lesser Himalayas, depositional environment of the Vindhyan, and Bagh-Lameta of central India, the Jurassic of western India, the Kareva of Kashmir, Outer Himalaya, and the east coast delta. Prof. Singh's Book "Depositional Sedimentary Environment" published by Springer Verlag in 1973, with Prof. H.E. Reineck, was translated in Chinese and Russian. He did pioneering work on the Ganga Plain and has evolved the concept of its evolution, geomorphology, geochronology, river dynamics and facies of the channel and inter-channel areas.

The qualitative changes in teaching and research in the field of Sedimentology in the department is credited to him. It was his vision and efforts that the department of Geology evolved as the main school of Sedimentology and made its mark on global fora. His nature and a strong sense of dedication to work were always a matter of discussion in academia. With significant ideas on research and higher education, and with a vision for building institutions and centers, his name is in the forefront. He was elected fellow of the Indian National Science Academy, New Delhi, in 1995. He received the National Mineral Award in 1996, the National Mineral Award of excellence in 2013, and the Geological Society of India L. Rama Rao Award of Excellence in 1996. The University of Lucknow, during its centennial Foundation Day, on 25th November 2020, honored him as an illustrious faculty member for his outstanding contribution.

Prof I.B. Singh was one of the finest human beings whom we have had the privilege of having amidst us as our teacher and supervisor. He was a mentor, teacher and guide, all blended into one, and his absence from this mortal world is an irreparable loss.

Heartfelt tributes to a guru, who will be always remembered by us.

- Dhruv Sen Singh, CAS in Geology, University of Lucknow, Lucknow
- Pradeep K Srivastava, WIHG, Dehradun
- Uma Kant Shukla, CAS in Geology, Banaras Hindu University, Varanasi

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Vol.3 No.2 August 2021

FROM OUR DESK

Dear Quaternary Enthusiasts,

On behalf of the President, AOQR, Dr. Vandana Prasad, I am happy to present the quarterly newsletter of AOQR, Volume 3(2), 2021. This issue contains news from the world of the Quaternary Sciences in the Indian Subcontinent for the last four months (April-July 2021). Apologies if anything is missing. India is a big subcontinent, with several Quaternary researchers working in many institutes and universities across its length and breadth and sometimes it is difficult to gather all these news and developments. We always request you to please send us any news regarding Quaternary research and we will publish it in the newsletter. Please be actively connected with us.

The past four months have been tough as the second wave of the COVID pandemic hit our country. In April, we lost Prof. M.S. Srinivasan, the pioneer of micropalaeontology and paleoceanographic studies in the country. Then one of our young scholars, Ms Sweta, also left us, and her untimely departure sent a wave of shock and grief. In this wave of the pandemic many of our near and dear ones, family and friends have been affected. We all have gone through a tough period of uncertainty, stress and anxiety. They say tough times make you stronger, and I hope that this makes us all a bit more sensitive, devoted, balanced and understanding towards our fellow human beings. I hope for the wellbeing and safety of you and everyone around you.

Despite this situation the association tried its best to connect with the young researchers. I am sure the students enjoyed the National level quiz competition on the theme "Geoarchaeology", conducted on May 9, 2021, for undergraduate, postgraduate and Ph.D. students, as also the AOQR Student Colloquium on July 2nd & 3rd, 2021. Prof. L.S. Chamyal, Prof. Vishwas Kale, Prof. Hema Achyutan, Prof. Shanti Pappu, Dr. Rajiv Nigam and Prof. A. K Singhvi are thanked for talking to and motivating the young minds present. I am elated to see the response and assure you all of many more of such activities on this platform in the future. Further, I thank the organising teams of these events. As we are committed towards the overall ascent of Quaternary research in the Indian subcontinent, we plan to organise regular meetings, national and international conferences, field workshops, laboratory trainings from time to time.

On behalf of our President and founder members, I welcome all the Heads and Secretaries of the five working groups of AOQR. This is your association, without you it cannot stand. This all is a team effort and shall only proceed with the support of the entire Quaternary research fraternity of India. Hence I request you all to join the AOQR and become active members of this initiative, join the working groups and share research, ideas and contribute towards this excellent venture. Your ideas for the progress, advancement and success of the AOQR are always welcomed.

Stay safe, stay connected

Dr. Binita Phartiyal

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PERSPECTIVES

Also termed as the Age of the Humans, the Quaternary and hominids have evolved together! The Quaternary is an extremely important period of Earth's History and the most relevant to man. The climatic changes therein shaped the evolution of landforms and man, extinctions, migrations, adaptations, and eventually civilizations! By the time the Quaternary had started, the continents had attained the present positions and thus the Quaternary archives provide the best window to the earth system processes operational even today. Additionally, the Quaternary records are comparatively more complete and also offer higher resolution as compared to the older periods. Thus, it is easier to tease apart the signatures of several processes functional together as well as identify the periodicity in their variation. That makes Quaternary an enigmatic time period to explore!

Having spent the past 20 years in the field of Quaternary Palaeoclimate, and working on several environmental settings, right from coastal estuaries, lagoons, beaches, tidal flats to coral reefs, shelves and the deep sea, I have realized that I cannot detach my science from James Hutton's Principle of Uniformitarianism which says "the same natural laws and processes that operate in our present-day scientific observations have always operated in the universe in the past and apply everywhere in the universe". The present is a key to the past and the past is a window to the future! Proxies and outcrops, and their history, need thorough understanding before being employed and interpreted. In case Quaternary observations need to be refined and be put to any reliable use, modern observations of processes, neoichnology, culture (in situ, field or laboratory) experiments, spatial sampling, quantitative and statistical techniques are inevitable.

Environment and Climate Change are important agendas for Sustainable Development Goals; Quaternary research has thus become a relevant discipline with increased opportunities and global scope. The present generation of driven researchers is blessed to be living in a 'global village' and has unprecedented access to analytical instruments, literature, collaborations and resource persons. Interestingly, the varied disciplines of Quaternary Science (geology, geomorphology, hydrology, climate, palaeontology, oceanography, archaeology, anthropology, geochronology, geochemistry, etc) are progressing collaterally in the recent past. However, what is still lacking is the unification of these disciplines for achieving a comprehensive understanding of the Quaternary and its geographical differences.

It is in this context, that I see the formation of the AOQR as a very crucial development in Indian Quaternary Science, which will go down in history as a turning point! AOQR has brought together several disciplines on the same platform, connecting those who are working in isolation. In the periodic colloquiums, talks and workshops by AOQR, researchers are presenting data sets which serve as calibration data sets to others working on completely different proxies from a completely different regime! I hope this brings about a newer synergy in Indian Quaternary Science! The Indian subcontinent offers many sites to study the Quaternary, ranging from terrestrial to marine realms. While it is impossible for any individual to master every discipline; it is imperative to publish new, publish sound science and publish fast. There is a need for different working groups, with diverse expertise to come together, refine interpretations and give way to radical thinking and new ideas. For example, when I was working on the Irrawaddy Delta Shelf of Myanmar (using benthic foraminifera), I found placement under the DAAD fellowship with a German mentor who was working on palaeo-lakes (using mollusks) which were hydrodynamically connected to the Irrawaddy. So we collaborated with an interest to correlate fluvial records with the offshore records! New researchers are very ambitious and have information at the click of their finger-tips. But, such information cannot replace the decades of experience of senior Quaternary scientists and academicians, who need to take younger aspirants under their wings and chisel sound researchers out of them. Years in the field and laboratory are imperative to assimilate the interdisciplinary challenges of the Quaternary. Rome was not built in a day and so isn't great science. I congratulate the entire founding team of AOQR to have made THE great beginning! It is now left to its beneficiaries how to make the best out of this platform.

I am hopeful all Quaternary researchers in India find themselves relevant to AOQR and unite as a community. This will not only give us an identity amongst the international Quaternary researchers, but will help us pioneer some very interesting science from the complex and dynamic Indian Subcontinent.

- Dr. Rajani Panchang
UGC FRP Assistant Professor & Secretary PSI Pune-Mumbai Chapter
Department of Environmental Science, Savitribai Phule Pune University

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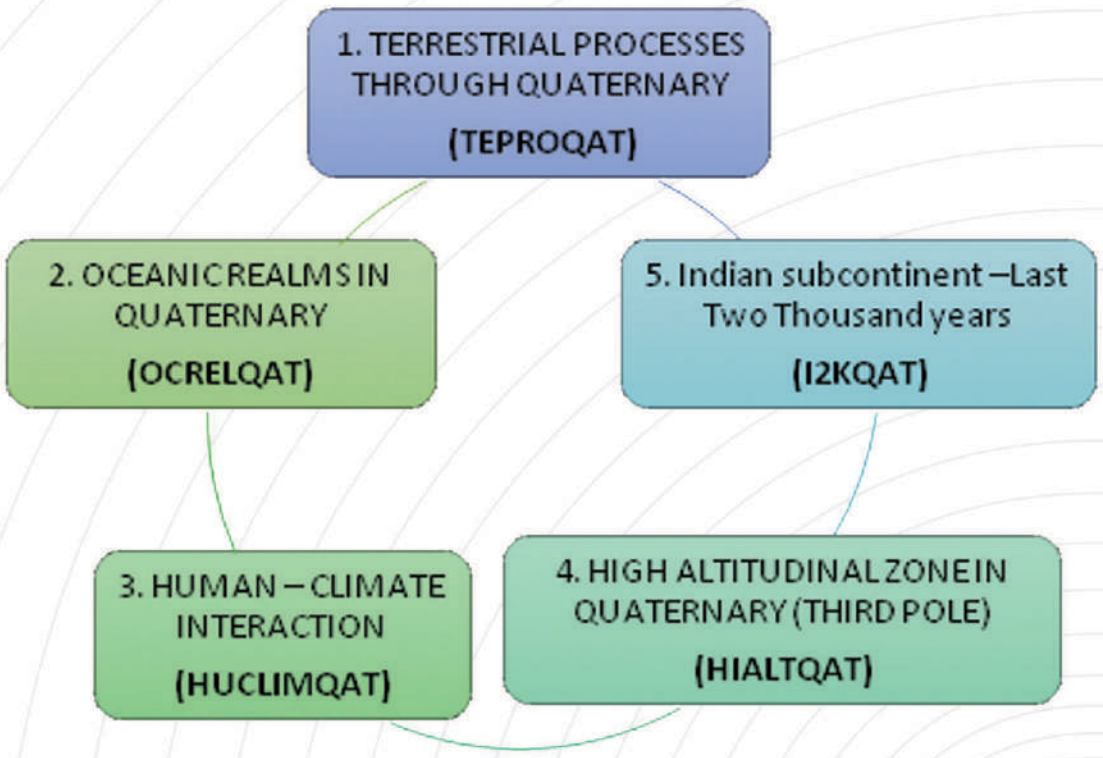
AOQR GROUP LEADERS & GROUP SECRETARIES *of the working groups and their views.*

AOQR has five active working groups-



TERRESTRIAL PROCESSES THROUGH QUATERNARY (TEPROQAT)

Group Head: Prof. D.M Maurya, MS University Baroda
Group Secretary: Dr. Anoop Ambali, IISER Mohali

The three year action plan of the working group

The social, physical, cultural and economic sustainability of the Indian subcontinent depends on the monsoon system and its space-time variability. The aim of the Terrestrial processes through Quaternary (TEPROQAT) working group is multi-proxy, multi-archive climate reconstruction to understand the impact of climate change on the different components of the geo-ecosystem. The TEPROQAT working group comprise of the following sub-components: i) Terrestrial biotic changes during Quaternary, (ii) Hydro-meteorological changes during Quaternary, (iii) High Resolution Palaeo-Proxy ensemble, (iv) Volcanism dynamics in Indian subcontinent and (v) Quaternary spatio-temporal correlations.

The three year action plan of the working group has been listed below;

1. Identifying gap-areas in paleoclimate research

The increase in spatial coverage of high-resolution paleoclimate data from the Indian subcontinent is essential for identifying underlying forcing mechanisms, threshold behaviour, and help in predicting the future impact of climate change in vulnerable regions. The TEPROQAT will attempt to bring together a diverse body of paleoclimate researchers and climate modellers to foster deeper inter-institutional engagement regarding issues concerning the risk of extreme events in vulnerable regions as global climate continues to change.

2. Paleoclimate data handling

The comprehensive database of paleoclimate records from the Indian subcontinent is needed to place recent warming into the longer-term context of natural climate variability. The TEPROQAT will generate a database of quality-controlled, published paleoclimate datasets (e.g., modern calibration, palynospectra, paleoclimate, diversity data, biomarker, and paleomagnetism) from the Indian subcontinent, and make access of the database to relevant stakeholders.

3. Funding acquisition for paleoclimate research

The working group will focus on crafting outlines for collaborative, multi-investigator proposals that, together, will (a) help characterize major climatological patterns (and causes) and (b) assess their impact on the environment, biological communities, and human societies.

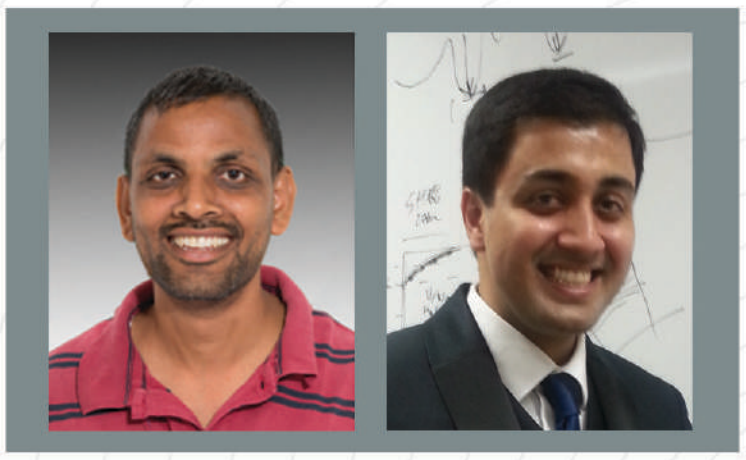
4. Training of students and community engagement

The working group will conduct training workshops with

stakeholders to share research results as well as co-develop strategies. The working group plans to organize field and laboratory based training programs for young researchers to attract them to the field of paleoclimate research. The working group also aims to provide them with a platform to share their research work, receive critical feedback from experts and refine their ideas.

OCEANIC REALMS IN QUATERNARY (OCRELQAT)

Group Head : Dr Rajeev Saraswat, NIO, Goa
Group Secretary: Dr. Sambuddha Mishra, ISC, Bangalore



Broad Aims & Objectives of the OCRELQAT Group:

The oceans cover close to three fourths of the Earth's surface, right from the equator to the poles. A vast range of flora and fauna depend on this realm. Oceans strongly modulate both the short and long-term changes in Earth's climate and provide a continuous archive of the past environment. Anthropogenic activities of the last few centuries have left their imprint in terms of altered water column structure and changes in seawater properties. The aim of OCRELQAT is to bring together researchers utilizing marine archives to generate continuous records of the vital climatic parameters covering the Quaternary. The activities on this group will be categorized under the following themes:

Ocean Monitoring: Modern ocean monitoring is the key to understanding the influence of anthropogenic activities on the seas surrounding us. This sub-group will integrate both the remote and in situ sensor data from the seas surrounding us and suggest gaps and regions to monitor in the future.

Oceanic Paleoclimate Proxies: Several indirect methods are used to reconstruct the past climate and oceanographic conditions from the marine archives. Such methods, termed proxies, have to be developed, refined and validated for the specific region. This sub-group will suggest comprehensive ways to improve the proxy development and validation work in the Indian Ocean.

Estuaries and Mangrove Ecosystem: The riverine input passes through a complex ecosystem of estuaries, towards the point where it meets the ocean. Estuaries, often lined by mangroves, substantially modulate the riverine input by the removal or addition of several elements. Therefore, a sub-group will facilitate proper budgeting of the terrestrial material input by the rivers into the ocean and suggest measures for the close monitoring of estuarine and associated mangrove ecosystems.

Near-shore Processes: The highly turbulent dynamics of the anthropogenically affected near-shore regions is entirely different from the relatively calm, deeper sea. The near-shore processes, especially sea level, strongly affect humans. A large spatio-temporal variability marks these near-shore processes, including the erosion and aggradation of different beaches at the same time. Therefore, a detailed plan will be prepared to prioritize the regions and processes to be addressed to understand the factors affecting near-shore regions and their implications.

Monsoon: Past, Present and Future: Despite enormous technological advances, agriculture, the mainstay of the economy of several tropical countries, is still largely dependent on monsoon precipitation. The records of the extent and intensity of the monsoons during different boundary conditions can help in better modelling of the precipitation in the future. This dedicated sub-group will identify locations to generate both long-term and high-resolution short-term monsoon records to address questions about the origins of the monsoons and the factors affecting the intensity and extent of the monsoons.

Paleo-ocean Circulation: The average pan-ocean movement of seawater, termed the thermohaline circulation, is the main conveyor for redistributing heat between different parts of the ocean and adjacent landmasses. The circulation also controls productivity and, thus, the ocean carbon storage. Both natural and anthropogenic activities affect ocean circulation. This sub-group will focus on understanding the factors affecting both the surface and subsurface ocean circulation during the past.

HUMAN – CLIMATE INTERACTION (HUCLIMQAT)

Group Head: Dr. Parth Chauhan, IISER, Mohali
Group Secretary: Dr. Prabhin Sukumarn, CHARUSAT, Gujarat

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A roadmap for the HUCLIMQAT Working Group

India is at the forefront of better contextualising the role of South Asia or the Indian subcontinent in understanding this area's regional and global impact on past climatic patterns. The Association of Quaternary Researchers (AOQR) represents a recently formed organization to intellectually bring together researchers and students in the Quaternary sciences. It is composed of a diverse and growing group of dedicated people interested in the natural environmental role of India in the last 2.6 million years. One of its working groups - Human-Climate Interaction or HUMCLIQAT - was formed to highlight and study the roles that diverse environments have played, and still play, in continuously shaping our evolution and adaptations, including our biology, technology and behaviour.

In that respect, the HUMCLIQAT working group has the following sub-components: i) Human Migration, ii) Evidences and Societal attributes of humans through the Quaternary, iii) Climate and Human interface in the Quaternary, iv) Anthropological impact and its attributes in Modern Times and v) Geoarchaeology, archaeological finds & human history. The Group Head is Dr. Parth R. Chauhan (Asst. Prof. at IISER, Mohali, Punjab) and the Group Secretary is Dr. Prabhin Sukumaran (Asst. Prof. at CHARUSAT, Changa, Gujarat). They have both been collaborating together on various projects in the Narmada Valley of Gujarat and Madhya Pradesh as well as the Tapi Basin in Maharashtra. Both are interested in better understanding the dynamics of climate-human interface throughout the Quaternary period and are striving to pinpoint specific areas of research towards that direction.

The office bearers of the working group have put forward a three-year working plan. The roadmap of the three-year work plan is divided into 3 checkpoints.

1. Publicity and fundraising: Since its inception, this working group has been very active and pivotal in pursuing different types of targeted and strategic tasks to promote Quaternary sciences at different levels. For example, it recently arranged a national level quiz which attracted 89 participants from across India. The group actively promotes its activities through different social media platforms such as the Facebook, Instagram and Twitter handles of AOQR. Most importantly, the group has actively contributed to the establishment of a national database, for the first time, of various professionals and students in the Quaternary sciences of India. So far, a database of 135 researchers has been prepared, which include established senior researchers, junior researchers, ECRs and numerous postgraduate and doctoral students.

The groups' future goals include the creation and dissemination of key educational resources for future generations of Quaternary scientists as well as bring together like-minded people for the purposes of intellectual growth and multidisciplinary collaborations through increasing problem-oriented projects across India to address past, present and future climatic and environmental issues.

2. Training and capacity building (from Chauhan & Sukumaran, 2016): In comparison to other subjects in Indian archaeology and Quaternary studies, paleoanthropology has declined significantly in recent decades as a prominent academic discipline in the Indian Subcontinent. Most archaeological research and teaching in South Asia is largely focused on younger time periods, primarily the protohistoric/Chalcolithic and Historical phases. In addition to a lack of general interest and lack of popularisation, another major reason for this decline in paleoanthropology may be the methodological challenges in interpreting complex paleoanthropological records, e.g. landform assemblage, paleoenvironmental reconstructions, assessing contextual integrity of the archaeological evidence (compared to younger sites) and so forth.

Due to inadequately preserved evidence compared to younger archaeological sites, the study of human history during the Quaternary demands a multi-disciplinary approach with highly sophisticated and extensive field-based surveys and integrated scientific analyses from geological perspectives. The lack of such multidisciplinary applications and knowledge centers may be also affecting the lack of interest to pursue paleoanthropological research during postgraduate and doctoral degrees. The working group is aiming to organize plenty of field and laboratory based training programs for young researchers to attract them to the field of geoarchaeological studies.

3. National Level Project Submission to establish special call for Geoarchaeology research: Hundreds of reported prehistoric sites, geological sections and Quaternary climate-and-process studies from the Indian subcontinent have not witnessed focused multidisciplinary geoarchaeological research till date. Therefore, such research is the need of the hour to generate a common tie between different branches of Quaternary science. The working group has put this ultimate goal in its bucket list to execute it in the coming three years. The group has initiated planning to mobilise such a program at the national level, where a large number of Quaternary researchers can work together with focused objectives. The group officials are anticipating cooperation and support from all stakeholders in achieving that major goal.

Chauhan, P.R., Sukumaran, P. 2016. Paleoanthropology. Current Science 110(5), 759-760.

Do join QuatChron_AOQR Google Group**!**
As a member of the group for Quaternary researchers working in South Asia, you will receive our Newsletter and other related information. [To join: open https://groups.google.com/, login (using Gmail account), search for "QuatChron_AOQR" and ask to join.]

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AOQR ASSOCIATION OF QUATERNARY RESEARCHERS

HIGH ALTITUDINAL ZONE IN QUATERNARY (THIRD POLE) (HIALTQAT)

Group Head Dr. Rakesh Chandra, Ladakh University, Leh
Group Secretary Dr. Vimal Singh, Delhi University

The high altitude mountains surrounding the Tibetan plateau form a significant part of the Third Pole. This area has a unique surface processes system that varies across the region. These processes have a direct impact on the different spheres - biosphere, lithosphere, and hydrosphere. The fate of several perennial rivers that receive a large volume of melt water are tied up with the glaciers in the third pole. Almost 1.5 billion people depend on these rivers. With the rapid changes brought about to the environment in the last few decades, we are under extreme pressure to understand and monitor these regions like never before. There are several challenges. The main challenge is to understand the complex interaction between the cryosphere, hydrosphere, atmosphere, and geological processes, and its impact on the social and economic well-being of the people dependent on these regions. The main objective of HIALTQAT is to identify the gaps in our current understanding of these regions, to generate the necessary data by expediting coordinated research, to initiate continuous monitoring of the region, and for capacity building. Although, the team members have some ideas related to activities to be performed by this group, we plan to come up with detailed activities after taking opinions of all the important researchers working in this area. The Group Heads of HIALTQAT are Dr. Pradeep Srivastava (IIT Roorkee) and Dr. Rakesh Chandra (University of Kashmir) and the Group Secretary is Dr. Vimal Singh (University of Delhi).

The sub-groups are:

- 4.1. Himalaya-Karakoram
- 4.2. Himalaya-Kanchenjunga
- 4.3. Trans-Himalaya
- 4.4. Glacial processes
- 4.5. Glacial monitoring

INDIAN SUBCONTINENT – LAST TWO THOUSAND YEARS (I2KQAT)

Group Head :To be filled (Position open for application)
Group Secretary Dr. Navin Gandhi, IITM, Pune

The sub-groups are:

- 5.1. Palaeo-proxies
- 5.2. Proxy-Climate modeling
- 5.3. Extreme events
- 5.4. Policy making–Societal Impact

Every sub-group will have a Leader (an expert) for which we want volunteers to take up the responsibility. Please come forward and contact the Group Leaders and Group Secretaries of the AOQR working groups.

ANNOUNCEMENTS

Dr Prabhin Sukumaran, Secretary of HUMCLQAT and a faculty at Charotar University of Science and Technology, Gujarat has been awarded the prestigious Fulbright-Nehru Academic and Professional Excellence Fellowship 2021. Under the fellowship, Dr. Sukumaran will be visiting the Stable Isotope Geochemistry Laboratory of the University of Illinois, Urbana Champaign, and will do the reconstruction of the paleoclimate of the Central Tapi River Basin, Maharashtra, to understand human evolution through the Quaternary.

Dr Nivedita Mehrotra, BSIP, Lucknow, has been elected as the new Chair of the ECR Committee of the Palaeoclimates Commission (PALCOM) of the International Union For Quaternary Research (INQUA). [https://www.inqua.org/commissions/palcom/people]

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ASSOCIATION OF QUATERNARY RESEARCHERS

PAST EVENTS

Report on the Earth and Space Exploration Program (ESEP) 2021

Siddharth Pandey[1] and Anurup Mohanty[2]
[1]Amity University, Mumbai
[2]SRM Institute of Science and Technology

Ladakh serves as a critical region that can help us train the explorers and field scientists of tomorrow. From understanding the past of our planet, the evolution of life, effects of climate change and training for exploration of the Moon and Mars. Towards this, a 3-year program has been established by Amity University, Cosmic Adventures Pvt. Ltd., Birbal Sahni Institute of Palaeosciences, University of Jammu, Ladakh Science Foundation and various other national as well as international partner organizations: Earth and Space Exploration Program, which was conducted between July 19th and August 2nd, 2021.

Earth and Space Exploration 2021 is India's first program that serves to bring together a diverse group of Earth and Planetary scientists and engineers to work together on understanding the changing ecosystem in Ladakh as well as prepare for the exploration of other worlds. The program also gives opportunities to the public to participate in scientific field research. This year's science and outreach goals were focused around the following fields – geology, geochemistry, molecular and microbiology, atmospheric and climate science, robotics and instrumentation, community engagement and outreach. The first crew made significant progress by taking measurements on the field and collecting samples. The crew was first trained by the resident scientists and catalyzed many collaborative projects. Tso Kar and Puga Hot Springs are the regions that were explored because of their scientific potential, accessibility and striking similarity to early Mars. Amity University has been actively working in order to establish a research station near Tso Kar, tentatively within the next 3 years.

The entire team of Crew I after returning from field sites

Some major field activities being conducted this year include the geophysical mapping of permafrost in the Tso Kar Region, the mapping of the Sinter Facies at Puga, microbiological characterization of the sites of interest and a rover testing at its highest altitude so far, at ~4530 meters (MASCOT-1).

Sampling and measurement of site parameters and Ground Penetrating Radar (GPR) to explore the subsurface of the Tso Kar basin.

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The Mars Amity Surface Characterization and Operations Trainer (MASCOT - 1) rover near the Tso Kar basin.

Event Review: National Online Quiz on "Geoarchaeology"

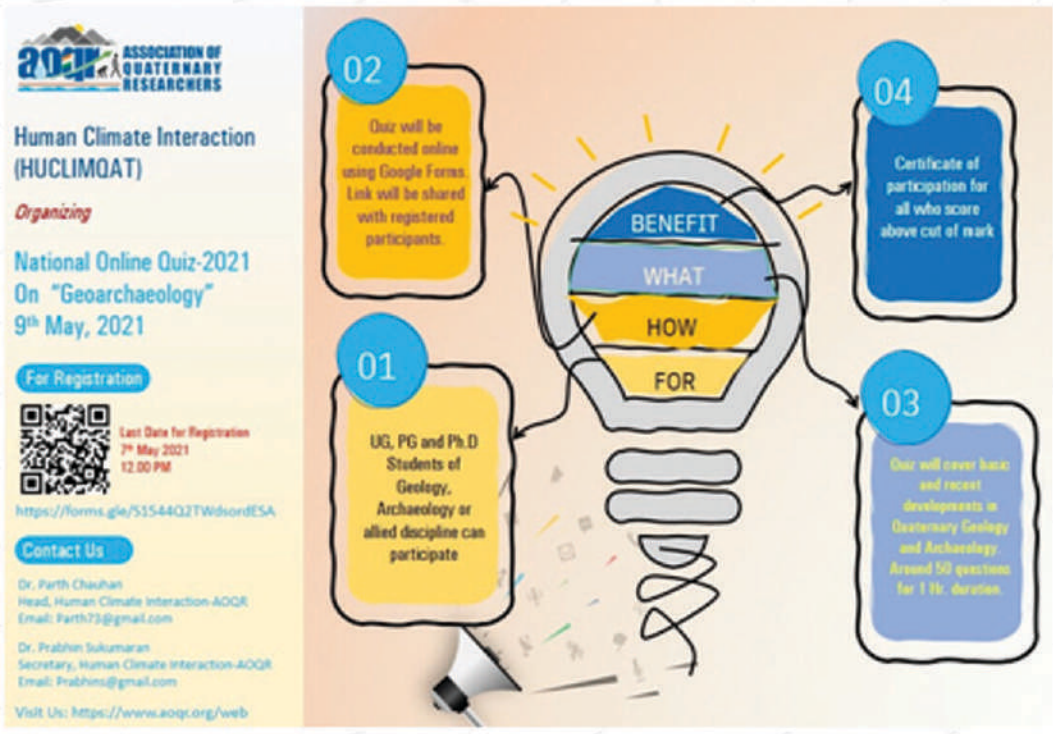
Parth R. Chauhan[1] and Prabhin Sukumaran[2]
[1]Department of HSS, Indian Institute of Science Education and Research (IISER) Mohali, Punjab
[2]Chandubhai S. Patel Institute of Technology, Charotar University of Science and Technology (CHARUSAT), Changa, Gujarat

The Association of Quaternary Researchers (AOQR) under its Human-Climate Interaction working group, organized a national level quiz competition for U.G., P.G. and Ph.D. students on 9th May 2021 on the theme "Geoarchaeology".

Geoarchaeological studies in India date to the 1860's, when a Palaeolith specimen was first collected from Tamil Nadu by a geologist, Robert Bruce Foote. Since then, a large number of studies from the Indian Subcontinent have witnessed a significant progress in archeological and Quaternary geological understanding. However, when their results are compiled to understand some of the primary questions about human evolution and culture change in India, and try to connect it with the global map, they reveal a marked lack of common ties between these results. In a nutshell, the geoarchaeological studies in India are still in a stage of disconnected independent studies. That requires a significant coordination and cooperation between all stakeholders of Quaternary research to address the more common questions such as: When did ancient hominins first enter the Indian subcontinent?; When did the first Homo sapiens groups enter the Indian subcontinent?; Did they enter the subcontinent through an inland route or through a coastal route?; Did they encounter and coexist with different species of archaic humans in the subcontinent?; Was the entry of Homo sapiens into the Indian subcontinent and the extinction of many animal species during the Quaternary related events?; Finally, what were the environmental factors for the gradual technological, biological, cultural and behavioural changes that occurred throughout the Quaternary period in India?

Many decades of Quaternary research from the Indian subcontinent could throw some light to addressing the basic questions. However, a lack of focused multi-disciplinary research attempts, and the near-absence of human fossils from India restrict us from drawing any conclusive interpretations. Interestingly, multi-disciplinary studies from various parts of India have recently given many success stories such as the dating of the earliest Acheulean and Middle Paleolithic assemblages, the recovery of the oldest known ostrich eggshells, the youngest-known dating of hippo fossils, more absolute dates for Indian Middle Palaeolithic assemblages, an increased understanding of the impact of the Toba super-eruption on hominin populations in India and the recovery of the oldest microliths (also contemporary with Sri Lanka).

When such studies have enhanced the confidence in Quaternary researchers regarding the scope and potential of geoarchaeological research, a general interest in such studies are comparatively lacking amongst the youngsters, largely due to lack of specific Quaternary topics in archaeology degree syllabi and the unawareness of recent research outcomes and newly-available methodological resources across India. Inculcating an interest in young minds is essential at this juncture, when we are expecting a paradigm shift in geoarchaeological research in India, as premier institutes such as IITs, IISERs, and many other institutes of national importance are getting involved in such multidisciplinary research. Keeping an ultimate goal in view of bringing the status of India onto a global map of geoarchaeology and

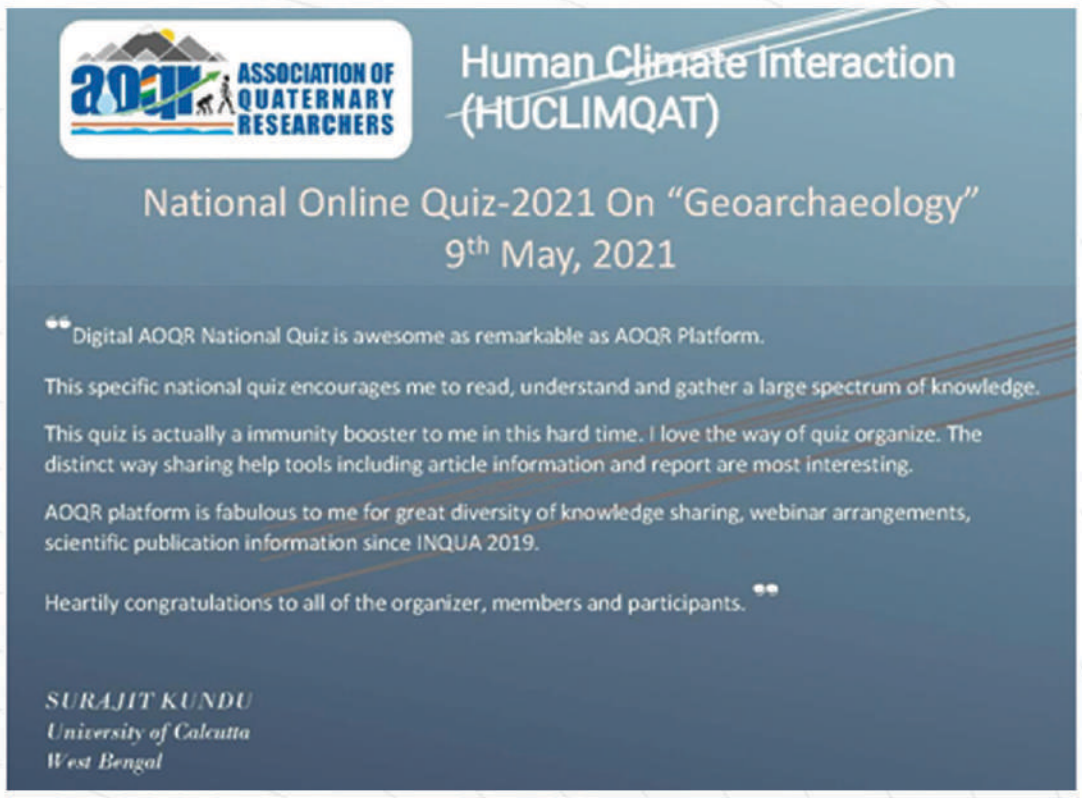


human evolutionary research and to meet the requirement of future Quaternary scientists and geoarchaeologists from the country, this competition was organized. The event was conducted in an online mode and was advertised widely beforehand through social media. The primary objective of the quiz was to spread awareness of geoarchaeological research in India and abroad amongst Indian students. To achieve the objective, an online questionnaire containing 44 multiple choice and true/false questions were prepared. Moving away from the traditional approaches of questions, more than 90% of the questions were based on some recent high-profile research articles that reported important international and national discoveries, around 5% were based on video tutorials and the rest of the questions were from fundamentals of Quaternary geology and archaeology.

For the research-article-based questions, a total of 12 recent publications were made available to the participants. These articles were published in reputed journals such as Nature, Science, Quaternary Science Reviews, Palaeogeography, Palaeoclimatology, Palaeoecology and Frontiers in Earth Science etc. Out of the 12 publications, it was necessary for the participants to read and understand four articles completely to answer the questions successfully, whereas questions from 8 articles were drawn in such a way that reading only the abstract would have enabled the participants to answer the questions correctly. Questions were also drawn from two short educational videos available on YouTube: one was about the use of stable isotope geochemistry as a proxy to climate interpretation and the second one was about the basics of human evolution. Altogether, the challenge was to understand the main aspects of the research articles and videos, which are primarily based on geoarchaeological research methods, concepts and interpretations, and answer conceptual questions regarding that understanding.

Out of 185 participants registered for the event, a total of 89 participants across the country successfully completed the quiz. Participants from 39 institutes across 18 states/UTs and various disciplines such as Geology, Archaeology, Geography, Environmental Science etc., and of UG, PG, M.Phil. and PHD levels had taken the quiz. Major student participation was seen from institutes such as The Maharaja Sayajirao University of Baroda, Central University of Punjab, Birbal Sahni Institute of Palaeosciences, Krantiguru Shyamji Krishna Verma Kachchh University and the University of Kerala. Out of 89, the participants who successfully scored more than 35% were provided with a certificate of merit and the top 10 ranked participants were given rank certificates.

Several participants appreciated the new approach of engaging youngsters, by updating them with new research outcomes and Quaternary analytical techniques. Overall, the positive response and high number of participants clearly reflects a genuine interest in geoarchaeology amongst students across India. This demonstrates a need



for more intellectual activities including education, promotion, hands-on training and public outreach in Quaternary studies and its subdisciplines in India - being planned and carried out by AoQR and its different working groups and subgroups.

AOQR Student Colloquium 2021: *A report*

Akash Srinivas[1] and Linto Alappat[2]
[1]Indian Institute of Science Education and Research (Mohali), India
[2]Christ College Autonomous, Thrissur, Kerala, India

Following the success of the AOQR ECR Webinar series in 2020, the AOQR had organised a two-day virtual colloquium for students from the various Quaternary Sciences to present and promote their research. Keeping in line with its commitment towards the overall ascent of Quaternary research in the Indian subcontinent, the AOQR Student Colloquium 2021 was conducted on 2nd and 3rd July, 2021. The primary objective of this colloquium was to provide students of the Quaternary Sciences with a platform to share their work, receive constructive feedback to develop their research projects, as well as build engaging collaborations with fellow peers. Out of the several entries received for this event, 19 were selected to make presentations and engage in discussion. The selected participants, comprising research students and scholars from various disciplines and institutions from different parts of India and the world, were categorised into five sessions over the two days. Each session had a session chair, who was an eminent Quaternary researcher, to give their advice and suggestions to the participants. Further, each presenter was also delegated a peer scholar discussant, to ensure constructive discussions or an alternate perspective on the research work presented by the students. The expected outcome was

Distribution of the reviews received for the AOQR Students Colloquium 2021

achieved through fruitful interactions between peer scholars and suggestions and guidance from the experts serving as Session Chairs. This has also helped Early Career Researchers, who were serving as the peer scholar discussants, to develop their skills in reviewing scientific work – an ability that is crucial for developing a research career.

The colloquium was hosted online with the assistance of the technical team from the Birbal Sahni Institute of Palaeosciences, Lucknow. Each session was moderated by a member of the organising team, which consisted of Binita Phartiyal, Secretary, AOQR; Prabhin Sukumaran, the General Secretary of the Human Climate Interaction Working Group (HUCLIMQAT) of the AOQR, and Linto Alappat and Akash Srinivas from the ECR team of the AOQR, under the support and supervision of the AOQR leadership. The sessions were planned to include a presentation by each of the participants for 10 minutes, followed by a peer review discussion and comments of about 5 minutes, open discussion with the general audience and concluding with comments from the Session Chair, which usually accounted for another 10 minutes.

The following five sessions were included in the colloquium (see the attached program schedule for more details of the papers discussed):
SESSION 1: Terrestrial Processes through the Quaternary
(Session Chair: Prof. L.S. Chamyal)
SESSION 2: Human - Climate Interaction and Geoarchaeology I
(Session Chair: Prof. Shanti Pappu)
SESSION 3: Indian Subcontinent: Last Two Thousand Years
(Session Chair: Prof. Vishwas Kale)
SESSION 4: Human - Climate Interaction and Geoarchaeology II
(Session Chair: Prof. Hema Achyutan)
SESSION 5: Oceanic Realms in Quaternary
(Session Chair: Dr. Rajiv Nigam)

The presenters and peer scholar discussants represented 26 Indian and International institutes and universities. Moreover, on an average, between 60 to 100 viewers attended the presentations, many of whom were students and ECRs. Attendees represented various regions of India and the colloquium also drew in international participants, with participants from Greece and Poland. Overall, the series was critically acclaimed, received tremendous support and an overwhelmingly positive feedback. Since the presentations and ensuing discussions were recorded, they will be made available to view and review on the website of AOQR (www.aoqr.org) and on the YouTube channel of the Association of Quaternary Researchers (www.youtube.com/channel/UC0--5r6xYc5FFTgYV-Pmu-A), for further outreach and engagement with those who missed the sessions.

The success of the AOQR Student Colloquium has prompted the association to take up more such planned webinars and talks, especially aimed at, and by, students of Quaternary Sciences in India and beyond. The organisers of the colloquium and the ECR team of AOQR are planning on releasing a future volume of the Quaternary Chronicles with

either graphical abstracts or plain text summaries and communications of these presentations. ***To keep up to date with the planned events and activities of the Association of Quaternary Researchers, follow the AOQR on Facebook, Instagram and Twitter (@AOQRIndia).***

Between April 2021 and July 2021, several novel research papers and book chapters incorporating wide scientific techniques were published in various national and international peer-reviewed journals. Some key highlights include:

Nag et al. (2021) *synthesise geomorphic indices of active tectonics to understand the prevalence of neotectonic activity in the Ladakh area through a combination of geomorphic field data, morphometric analysis, and previously published data. The authors suggest that the Indus River valley along Indus Suture Zone in Ladakh Sector could be differentiated into three morphotectonic segments based on geomorphic metrics.*

Kothyari et al. (2021) *focus on the identification of tectono-morphic features in a climatically induced and tectonically driven Himalayan system, and combine morphometric analyses with field study along Soan Thrust in the northern margin of Soan Dun. Their field study exemplifies the presence of fault scarps, triangular facets, transverse faults, V-shaped valley, and folded Quaternary sediments, which signifies the Holocene crustal deformation in the frontal sub-Himalayan zone of Himachal segment.*

Solanki et al. (2021) *employ sedimentology, geochemistry and optical dating to investigate terrace sequences from the valley fill deposit in the Shetrunji River basin in Saurashtra, western India. The authors suggested that the region experienced a widespread valley aggradation around the ~18–9 ka period, followed by intense erosion between 9–7.5 ka, and then another valley aggradation during ~7.5–5 ka which was ended by the incision post 5.5 ka in the lower reaches of the Shetrunji River.*

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Sharma et al. (2021) summarise the existing chronometric data of fossil dunes preserved in the southern Thar Desert margin to understand the episodes of dune accretion and causes of their spatial and temporal variability along the precipitation gradient. The authors identify three major phases of dune accretion and conclude that after ~15 ka the Thar shows a broad synchroneity and that coincides with the gradual strengthening of the Indian summer monsoon.

Kothyari et al. (2021) study the landforms in the central segment of Northern Hill Range which marks the surface expression of Kachchh Mainland Fault (KMF), to understand the role of climatic changes and tectonic activity during the time of aggradation and incision, and suggested that the deformation pattern close to KMF is the result of localized compressive stress generated between two fault segments.

Vanik et al. (2021) conduct detailed tectono-geomorphic studies to provide an insight into the swarm activity from a geomorphological perspective around Bhavnagar and Jamnagar in Saurashtra, western India. The authors inferr that the generation of earthquake swarm activity comprising low to moderate magnitude shocks is caused by the sheared rocks along the Sihor Fault near Bhavnagar and the ENE-WSW trending subsurface structure near Lalpur.

Srivastava et al. (2021) study calcretes from the Quaternary alluvial deposit of Purna basin, central India for their morphological details, lithological associations in both vertical and lateral profiles of the alluvial deposit and paleoclimatic reconstructions. The authors show that that the area under investigation has undergone through subtropical, arid and semiarid climatic conditions having low to medium humidity, high rainfall and evaporation that favoured formation of various types of calcretes.

Khangembam and Singh (2021) follow a multi-parameter approach comprising the Stiff diagram, Durov diagram, water table contour map, hydrochemistry, and stable isotope has been used to elucidate characteristics of hydrochemical facies along the groundwater flow across different geomorphic terrains in the Barak Valley of northeastern India. The authors identified three clusters belonging to the piedmont, alluvial, and flood plains, indicating spatial evolution of hydro-facies along the flow path.

Manoj et al. (2021) present the last ~2k rare earth elemental (REE) records of the sediment core from the Cherai, Kerala coast to suggest a close link between monsoonal precipitation and REE records in the southwest coast of India. The authors suggest that during the Dark Age Cold Period/Medieval Warming Period transition, a sudden increase in monsoon is documented and the monsoon precipitation was further decreased during Little Ice Age and Current Warming Period.

Tiwari et al. (2021) discuss new data related to microlithic occurrences in Hoshangabad and Sehore the central Narmada Basin, Madhya Pradesh. The authors present preliminary dates from key areas of distribution in order to understand the geochronological contexts of microliths at Pilikarar, Morpani and Gurla-Sukkarwada; initial OSL dates from these respective occurrences range between 12.5 and 2.3 ka.

Further, Singh (2021) studies assemblages and associated raw material sources in the same central Narmada Valley and attempts to link these raw material sources with the occurrences of Palaeolithic sites in order to have a better understanding of past hominin land-use patterns and ecological adaptations.

Mehra (2021) provides an initial report on Doma, a newly discovered site with the first-known stratified bifaces in the Lower Son Valley in north-central India based on the sedimentary sequence, archaeological surveys, topographical mapping, raw material and the overall palaeoanthropological assessment. The author suggests that the oldest Palaeolithic evidence at Doma broadly resembles Late Acheulean sites dated to c. 140–120 ka in the nearby Middle Son Valley, and could be helpful in developing a testable model of technological transitions within a palaeoenvironmental framework, in the future.

Srinivas (2021) reports on a series of field observations and remotely sensed data collected to understand the distribution pattern of the various Palaeolithic localities of the Kibbanahalli Palaeolithic Complex, southern India. The author highlights the critical role played by modern-day land-use patterns on the observed distribution of the archaeological record, as well as its visibility, and further stresses on the need and necessity to understand the role of various site formation processes.

References:

Khangembam, S. and Singh, K.K., 2021. Arabian Journal of Geosciences, 14(14), pp.1-11.

Kothyari, G.C., Joshi, N., Thakur, M., Taloor, A.K. and Pathak, V., 2021. Quaternary Science Advances, 3, p.100017.

Kothyari, G.C., Kandregula, R.S., Chauhan, G., Desai, B.G., Taloor, A.K., Pathak, V., Swamy, K.V., Mishra, S. and Thakkar, M.G., 2021. Quaternary Science Advances, 3, p.100018.

Manoj, M.C., Thakur, B. and Uddandam, P.R., 2021. Environmental Forensics, pp.1-16.

Mehra, S.B., 2021. Geological Society, London, Special Publications, 515.

Nag, D., Phartiyal, B. and Joshi, M., 2021. Catena, 199, p.105103.

Sharma, S., Bhattacharya, F. and Chauhan, G., 2021. Journal of Earth System Science, 130(2), pp.1-13.

Singh, V., 2021. Geological Society, London, Special Publications, 515.

Solanki, T., Prizomwala, S.P., Makwana, N. and Solanki, P.M., 2021. Quaternary International, 585, pp.70-84.

Srinivas, A., 2021. Geological Society, London, Special Publications, 515.

Srivastava, A.K., Bansod, M.N. and Khare, N., 2021. Rhizosphere, 18, p.100343.

Tiwari, N., Morthekai, P., Krishnan, K. and Chauhan, P.R., 2021. Geological-Society, London, Special Publications, 515.

Vanik, N., Maurya, D.M., Shaikh, M., Padmalal, A., Tiwari, P. and Chamyal, L.S., 2021. Quaternary International, 585, pp.111-133.

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

IN MEMORIAM

Prof. M.S. Srinivasan
(1938 - 2021)

Prof. M.S. Srinivasan, Professor Emeritus, Department of Geology, Banaras Hindu University (BHU), took his last breath on 29th April, 2021 at the age of 83. He was one of the pioneers of micropaleontology and paleoceanographic studies in the country. His unfortunate departure due to COVID-19 sent a wave of shock and grief across the entire earth sciences community in India.

Prof. Srinivasan was a prolific researcher. He was born in Varanasi in 1938. He graduated from BHU and later joined the Department of Geology, BHU in 1960 as a faculty member. He went to Victoria University, Wellington, New Zealand on a British Commonwealth Fellowship for his doctoral research and obtained his Ph.D. degree in 1965. After returning to his alma mater, Prof. Srinivasan established the Micropaleontology Laboratory in the Department of Geology and initiated research and teaching in this field. His research interests were largely focused on Neogene foraminiferal biostratigraphy and evolution. He pioneered a systematic micropaleontological study of the uplifted marine sequences of the Andaman and Nicobar Islands, and published the classical monograph on "Schwager's Car Nicobar Foraminifera in the reports of Novara Expedition: A revision". He visited the British Museum (Natural History), London (1968-69) and examined the foraminiferal type collections. While there, he further specialised in SEM studies. He was a Visiting Scientist at the Graduate School of Oceanography, University of Rhode Island, USA (1972-74, 1979-81), where he carried out research on various aspects of oceanic biostratigraphy and paleoceanography. During this stint, he significantly contributed and co-authored several classic publications on Paleoceanography and Neogene Planktic Foraminifera including "Neogene Planktonic Foraminifera: A Phylogenetic Atlas". The planktic foraminifera atlas is regarded as one of the most important publications and is highly referred to by the researchers world over working in the field. Prof. Srinivasan participated in the Deep Sea Drilling Project (DSDP) Leg-90 on board the D/V Glomar Challenger in the South Pacific (1981-82) as a shipboard scientist. Prof. Srinivasan also visited many reputed institutes all over the world including New Zealand, U.S.A, U.K., Japan, Canada, Netherlands, Russia and Thailand. He has been the Leader of the International Working Group on 'Equatorial Pacific Neogene Chronostratigraphy' and an executive member of the regional committee on 'Pacific Neogene Events'. Prof. Srinivasan was Chairman of the IUGS National Committee twice and has been a leading member of IGCP Programs. He was a member/chairman of several scientific committees of various government organisations, academic and research institutions.

Author of 180 national and international publications including 3 books, 1 monograph, several chapters in various books and 1 edited volume, Prof. Srinivasan was a fellow of all three national science academies and the Third World Academy of Sciences. Prof. Srinivasan received the UGC National Lecturer Award (1984-85), the First Malavia Memorial Trust Senior Academic Award by BHU (1986), Prof. L. Rama Rao Gold Medal (1988), Platinum Jubilee Lecture of ISC (1991), Hari Om Ashram Trust Award by UGC (1994), Swami Pranavananda Saraswati Award (2001), Prof. M.R. Sahni Memorial Lecture (1989), Prof. Birbal Sahni Memorial Lecture Award (2002) and Dr. H.N. Siddiqui Memorial Lecture (2008). Given all of his administrative and teaching responsibilities, it is truly incredible that Prof. Srinivasan maintained an outstanding research career.

Prof. Srinivasan served as Head, Department of Geology, BHU (1984-86) and Director, Academic Staff College, BHU (1991-93). After his superannuation in 2001, he was INSA Hon. Scientist (2001-2003) and INSA Senior Scientist (2003-2008). In recognition of his distinguished services, BHU honoured Prof. Srinivasan by appointing him as Professor Emeritus in the Department of Geology, BHU.

He was a researcher who dedicated his entire life to Micropaleontology & Paleoceanography and its development. During his long illustrious career spanning almost six decades, he motivated and inspired a whole generation of Indian and overseas students, including 14 Ph.D. students. Commonly called 'Guruji' by his disciples, he was still active even after his superannuation and served as a guardian and a great source of inspiration for the younger generations working in the field. Besides being an outstanding scholar and a teacher, Prof. Srinivasan was an exceptionally humble and dedicated man, and is regarded as one of the most revered earth scientists in the country.

His presence and blessings will forever be missed.

Compiled by - Komal Verma, Assistant Professor of Geology, Institute of Science, BHU.

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

IN MEMORIAM

Ms. SHWETA
(1992-2021)

Frankly, for me it is really difficult, as I have never imagined that I have to write such a note for my dearest friend. Ms. Shweta (1992-2021) was a research scholar working at the Wadia Institute of Himalayan Geology (WIHG). She was born on 24 August 1992, in Vikasnagar (Dehradun) and did her graduation and post-graduation degrees from DBS, College (Dehradun). In 2016, she joined the Ph.D. program at WIHG under the supervision of Prof. Anil K. Gupta. She was working on the topic to understand the past climate variability in the Indian monsoon domain using lake sediments as climate archives. During her Ph.D., she attended a workshop on stable isotope at the University of Konstanz. She approached a few scientists from the university and was planning to apply there for further higher studies. Even during her short period of research, she had a collaboration with several institutes, like IISER Mohali, ISM Dhanbad, and Garhwal University. Her Ph.D. career was a roller-coaster ride. During her Ph.D., she faced several challenges, and she overcame all such challenges, emerging out of such situations full of confidence and eager to do something new. This inspired us around her a lot, and to do better in this competitive scenario.

Her cheerful attitude towards life and enthusiasm towards the scientific attitude made her an excellent researcher and an overall nice human being. I could not imagine when I heard the news of her untimely demise. She has created a void in our lives which is difficult to fill. I hope, wherever you are, you will always be remembered for your friendly and caring nature towards your colleagues, friends and families. In this hour of grief, I, on behalf of the WIHG, convey our deep condolences to her family.

- Dr. Praveen K. Mishra, WIGH, Dehradun.

If you would like to describe a recent thesis on any aspect of the Quaternary sciences, either your own work or of any of your student's, and would like it to appear in the AOQR newsletter, do write to us on ***aoqr2019@gmail.com*** *with the subject PhD thesis, along with a short summary of the work, the name of the research scholar, supervisor(s) and their affiliations, and see it featured here! You can also send any images you would like to feature along with the description and summary of your work.*

ASSOCIATION OF QUATERNARY RESEARCHERS

Quaternary Chronicles

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Vol.3 No.3 December 2021

FROM OUR PRESIDENT'S DESK

Dear Quaternary Family,

We are completing our second year on the 12th of this month. I would like to congratulate you on the second Foundation Day of AOQR. This journey was successful and inspite of the ups and downs of the trailing pandemic period, the association was able to fulfill its objectives and bring the Quaternary fraternity together.

During the entire second year of its journey, online training programmes, student colloquium, quiz, legends talks, etc. were organized to bring together all the Quaternary researchers across the Indian subcontinent. AOQR started the Legends Talks series in January this year, in which Prof. Martin Williams, Australia and Prof. Victor Baker, USA, interacted with the Quaternary family. Unfortunately we could not continue it due to some unavoidable circumstances, but intend to start them again soon. AOQR together with BSIP, Lucknow, successfully conducted an online National level "Training on Quaternary Palynology" in February 2021, which attracted sixty-one participants from various institutes and universities across India. Later in May 2021, a National level Quiz on Geoarchaeology was organized with the primary objective of spreading awareness of geoarchaeological research. A total of eighty-nine participants across the country took part in the event.

CONTINUED ON PAGE 2

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FROM THE PRESIDENT'S DESK

In July 2021, the AOQR Students Colloquium was held with the primary objective of facilitating enhanced interaction and collaborations amongst young researchers. Apart from these activities, five working groups were formed, and Group Heads and Group Secretaries took over their responsibilities of running the groups successfully. The AOQR Newsletter, Quaternary Chronicles, was published on time (https://www.aoqr.org/ web/publication). Thanks to the Secretary, Dr. Binita Phartiyal, and the young ECR team that have done this endeavor so efficiently. AOQR is now organizing the Indian Quaternary Congress (IQC) which is designed as a biennial meeting to be hosted by AOQR during January-March of every second year, 2022 onwards. The congress will encompass all aspects of the Quaternary, from both the terrestrial and marine domains. I invite all of you to participate in this first IQC.

With these updates of yet one more year of the 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 team for efficiently managing the association activities round the year. My special thanks to our Governing body members and Honorary members for their guidance and time. I congratulate and thank all the members of AOQR and the Quaternary family of India for their trust and faith in the AOQR. Your support is always a boon to the association.

As we enter into the last month of the year 2021, I hope the year has been successful for all of you and wish a very Happy 2022. We will meet soon in the IQC-2022.

Till then, Stay Safe, Stay Happy
Dr Vandana Prasad

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PERSPECTIVES

The Quaternary period spans only a short time-range when compared to the complete geological history of the Earth. Yet, this period witnessed major climatic and environmental changes. Climate variability during these time scales is mostly caused by the Earth's orbital changes, solar insolation, volcanic radiations, and the unpredictability in sea surface and atmospheric temperature. However, the variability during recent time scales is influenced by both the natural (e.g., solar output, teleconnections such as El Niño Southern Oscillation - ENSO, North Atlantic Oscillation - NAO, meridional shifts of the Intertropical Convergence Zone - ITCZ, Indian Ocean Dipole - IOD) as well as anthropogenic factors. In a global warming scenario, the extreme changes in climate variability have serious socio-economic consequences on human societies. Further, various climate model simulations have shown the behaviour of these extreme events (e.g., heavy rainfall and drought, hurricanes) is expected to intensify in the future. In a current global warming world, modern instrumental data are associated with several uncertainties, and thus, it is highly difficult to rely on a single climate model. Therefore, to predict future climate variability and their implication on human societies, it is crucial to have longer climate records that go beyond the instrumentation era. They provides crucial information about past boundary conditions (e.g., solar insolation, volcanic radiations, sea surface and atmospheric temperature, etc.) that can be utilized for future climate predictions.

The Indian subcontinent is unique in terms of the interaction between various moisture regimes (Indian summer monsoon - ISM, north-east monsoon - NEM and mid-latitude westerlies), population density, and many diverse physiographic features. Therefore, the paleoclimate studies from such diverse regions are crucial in order to improve our understanding of the temporal evolution of climate variability on different timescales. Paleoclimate studies from the Indian region have demonstrated that the relative influence of these atmospheric circulations have shown a considerable variation in their intensity and their spatial extent in the past.

Most of the paleoclimate records from the Indian subcontinent are available from the NW Himalayan region. In comparison, only a few high-resolution records are available from the core monsoon zone of India. This leads to spatio-temporal heterogeneity in the paleoclimate records which bias our interpretation of past climate variability and thus, make difficult to comprehend future climate projections. In the Indian scenario, these studies largely follow the comprehensive multi-dimensional approach for climate reconstruction, i.e., (i) establishment of proxy behaviour in modern environmental conditions; (ii) the application of proxies in varied geological settings; and (iii) decouple the role of anthropogenic and natural climate variability on natural archives. However, certain issues such as (a) non-linear response of proxies due to "non-stationarity" in climate proxy relationship; (b) chronological uncertainties; (c) lack of high-resolution records; and (d) lack of intercomparison of paleoclimate data, hinder our understanding of past climate variability. Therefore, coupled approach along with the multiproxy approach (e.g., geochemistry, stable isotopes, pollens, biogeochemistry, grain size, etc.) is required in order to comprehend past climate variability and their forcing factors. Further, an interdisciplinary approach is vital to advance our understanding and is crucial to address and fill the gaps in our knowledge of the past climatic conditions. AOQR was established in 2019 with an objective to bring groups of leading scientists from varied fields of Quaternary research into one platform. The association will be a turning point for the Indian Quaternary fraternity where interdisciplinary collaborations between geologists, environmentalists, climate modellers, and policymakers enable researchers to share their ideas and research outputs, and gain new perspectives in Indian Quaternary research. Further, this provides new opportunities for young researchers and can be a key to their career development.

Dr. Praveen K. Mishra
Wadia Institute of Himalayan Geology, Dehradun;
Group Leader, Indian Subcontinent - Last Two Thousand Years (I2KQAT), AOQR

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PERSPECTIVES

A Mega Lake Project - Need for Indian Quaternary

The livelihood of a ~140 crore Indian population largely depends on the behaviour of the Monsoon system and it has a significant impact on the present economic and social activities. The climate in the Indian subcontinent is primarily related to the dynamics of the seasonally reversing monsoon wind system involving the complex interactions of the atmosphere–ocean–land–cryosphere system on different space and time scales. Besides natural forcing there is evidence that anthropogenic activities have influenced regional climate in recent decades. The recent evidences of human-induced climate change such as increasing heat extremes, changing monsoon patterns and sea-level rise pose serious threats to lives of the people residing in the subcontinent. Therefore, it is inevitable for us to develop a greater understanding of the monsoon behaviour. However, the unavailability of long-term (for hundreds to thousands of years) instrumental records of the climate is limiting the development of future climate models. The use of different climate proxies may help overcome the paucity of long-term datasets.

At the national level, there are several institutions and scientists actively involved in studies related to the monsoon behavior during the Quaternary period using different biotic and abiotic tools. However, most of these studies have several limitations – like low resolution, sub-critical level, data quality, proxy validation and chronology. This makes it necessary to understand how and why climate is changing across India, and how these changes are expected to evolve in the future. There is no doubt that in the last few decades significant work has been carried out using a variety of climate proxy parameters. However, substantial knowledge gaps with regard to climate projections, particularly at smaller spatial and temporal scales, still need to be addressed. It is necessary to reduce the range among climate model projections of future changes in Indian Ocean warming, regional sea-level rise, tropical cyclone activity, weather and climate extremes, changes in the Himalayan snow cover, etc. It is essential to deepen our understanding of the science of climate change, improve the representation of key processes in climate models (human–climate relationships, climate-vegetation feedbacks, etc.) and also build human capacity to address these challenges.

Lakes are particularly good recorders of climate variability because sediment from the surrounding environment accumulates in lakes, making them sensitive recorders of climate variability and providing high-resolution histories of local environmental conditions. Lake sediments play an increasingly important role in the research of global change and regional environmental evolution because they can demonstrate continuity, and environmental and seasonal sensitivity, therefore providing high resolution and typically abundant environmental and climatic information. In view of the above, the Quaternary group of the BSIP, Lucknow, has started working on the "Lake Coring Project" to address the issue of high resolution climate variability from different physiographic zones of India in a phased manner. The goal of this program is to reconstruct the palaeoclimate of the Late Quaternary, with special emphasis on the Holocene, using multi-proxy (both biotic and abiotic) with temporally highly resolved sampling.

Dr. Anupam Sharma
BSIP, Lucknow

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NEW WORK

Dr. Sheikh Nawaz Ali
&
Sunil Shukla
BSIP, Lucknow

Over the geological time scale, the Quaternary period offers an opportunity to understand the most recent changes in Earth's history. The changes during the Quaternary period are imperative not only in terms of climatic variability but also for understanding the evolution of human civilizations and sustenance. The Association of Quaternary Researchers (AOQR) was founded a few years ago by a group of dynamic researchers, and it provided a relevant forum for eager and creative minds to express their scientific perspectives.

Ladakh has attracted researchers over time as it provides the most important evidence of Himalayan evolution, geology and tectonics. With its uniqueness, including geological features, landforms of different origins, freshwater and saline lakes, extreme weather conditions – Ladakh (Cold Desert) is considered as a natural laboratory that mimics extra-terrestrial conditions. Apart from their interesting geomorphology, high-altitude freshwater lakes also act as a bridge to understanding life under extreme conditions. Although high-altitude freshwater lakes and hot-water springs provide important insights about the ecology of harsh environments, the current perspective aims at discussing the possibilities and adaptive measures of life under extreme conditions in a unique red glacial lake that has been recently reported.

The existence of this rare red/brown-colored proglacial lake in the Photoksar valley of the Ladakh (Zanskar) Himalaya invoked researchers to figure out the origin, chemical composition, and life-sustaining capabilities of this high-altitude glacial lake. The lake is present at an altitude of ~5060 m asl and located on the metasedimentary rocks of the Zanskar Range, which are rich in ironstone. As a result, it has been hypothesized that the lake's red colour is influenced by local lithology (soluble iron complexes) via glacial melt water. There have been several reports of colorful lakes across the globe, and the colouring has been attributed to both local lithology and the microorganisms that dwell in these water bodies. The red colour of water can be caused by bacteria/algae such as Dunaliella salina, Halobacteriaceae or Planktothrix rubescens. However, the occurrences of such bacteria has been reported from different low-altitude lakes. The unique high-altitude location of the Himalayan Red Lake, which is characterized by extreme meteorological conditions, calls upon researchers

#NEWWORK

to explain the possible mechanism of lake water coloring (lithology vs microorganisms), and the type of microorganisms dwelling in such extreme conditions. This will not only help in understanding the lake dynamics but also give important insights on the biogeochemical response of the extremophiles living in such harsh environments.

The colour of saline lakes (e.g., Lonar Lake in India, Lake Urmia in Iran, Fish Lake in Minnesota, and Blood Falls in Antarctica) have been attributed to bacteria or algae. Given that the Himalayan Red Lake is a typical glacier-fed meltwater lake (fresh water), the existence of salty microbiota in the lake is highly unlikely. This provides us a new avenue for understanding the different kinds of extremophiles and their adaptability to such extreme environments. Now, the main questions that needs to be answered are 1) if the coloration is governed by the local lithology, the mechanism of continued suspension (since at least the last 40 years) of the sedimentary particles needs to be understood, and 2) if the coloration is influenced by microorganisms, the types and nature of microorganisms that survive in such an extreme environment must be investigated. Researchers from the Birbal Sahni Institute of Palaeosciences conducted a thorough field expedition, which included geomorphological mapping of the area, and the collection of rock samples and water samples from the catchment area and lake for biogeochemical study. The study's major goal is to determine the chemical composition of catchment geology, melt and lake water samples, and to determine the microbiota and its (if any?) role in the lake's coloration. Molecular biology (mainly DNA tests) will be used to conduct a thorough examination of the microbiota that may be responsible for the colouring caused by pigmentation. This will also give an insight into the function of contemporary microbial communities in weathering processes (?) and, as a result, the reddish colouring of melt water.

The AOQR brings together the expertise of researchers from different domains to come up with the most relevant scientific findings and provide a benchmark for thriving Quaternary studies in India.

- Dr. Sheikh Nawaz Ali
& Sunil Shukla, BSIP, Lucknow

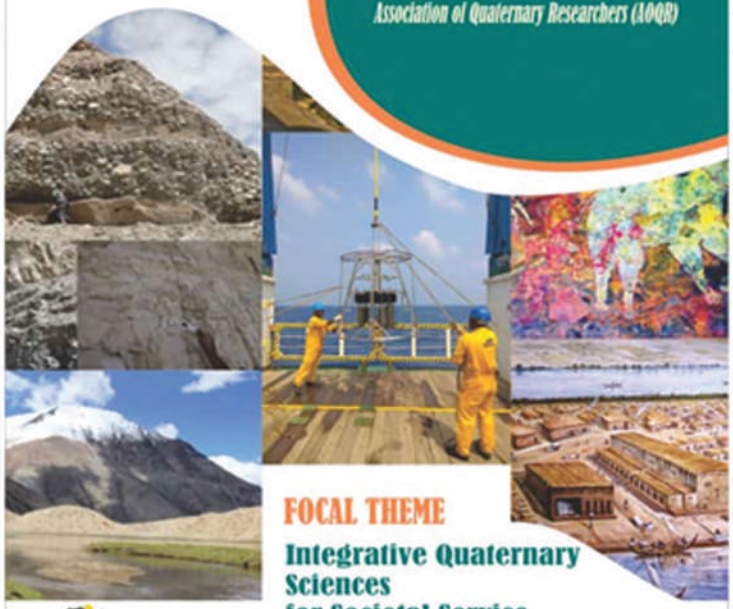
UPCOMING EVENTS

1st IQC

1st Indian Quaternary Congress

IQC-2022
VIRTUAL CONFERENCE
19-21 JANUARY 2022

Hosted by
Association of Quaternary Researchers (AOQR)



FOCAL THEME
Integrative Quaternary Sciences for Societal Service

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THEME 5: INDIAN SUBCONTINENT –LAST TWO THOUSAND YEARS
5.1. proxies and records
5.2. climate modelling
5.3. Policy making-Societal impact
5.5. Quaternary Learning and education group

Registration fee

AOQR members — Free Registration

Non- AOQR members	INR
Academic- Students	300.00
Academic - Professional	500.00
Industry/Commercial	2000.00

All registered participants will have access to full abstract volume, session proceedings and a conference souvenir. The proceedings will be published in SCI Quaternary speciality journal. The name of the journal will soon be finalized.

Important Dates:

Registration Opens	15 October 2021
Abstract Submission Opens	15 October 2021
Abstract Submission Closes	15 December 2021
Abstract Acceptance	31 December 2021
Decision on Presentation Mode	10 January 2022
Registration Closes	10 January 2022

Registration link

https://forms.gle/QQCYBfsv2ftNPMU77

SCAN ME

IQC-2022

33RD CONFERENCE OF THE INDIAN INSTITUTE OF GEOMORPHOLOGISTS (IGI)

AN ONLINE INTERNATIONAL CONFERENCE ON THE THEME
Geomorphology & Environmental Sustainability
December 02-04, 2021
ORGANISED BY
DEPARTMENT OF GEOGRAPHY
UNIVERSITY OF ALLAHABAD, PRAYAGRAJ

IGI

IMPORTANT DATES
- ABSTRACT SUBMISSION:. 20 NOV, 2021
- ACCEPTANCE INTIMATION: 28 NOV, 2021
- FULL PAPER SUBMISSION:. 30 NOV, 2021

IMPORTANT LINKS
- Conference Website
- Registration Form

PAYMENT DETAILS
- INDIAN DELEGATES:. ₹ 500 ONLY
- RESEARCH SCHOLARS/STUDENTS: ₹ 400 ONLY
- FOREIGN DELEGATES: US$ 25 ONLY
- NAME OF THE ACCOUNT: 33RD CONFERENCE OF INDIAN INSTITUTE OF GEOMORPHOLOGISTS(IGI)
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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
Sunday, December 12, 2021

Professor Philip Gibbard
Scott Polar Research Institute
University of Cambridge, England
will be the Chief Guest
and
deliver the 2nd Foundation Day Talk

Prof. D. M. Banerjee,
Chairman, INSA-INQUA Committee, India
will preside over the function

Function will be carried out on virtual platform (Meeting link will be shared)

Prof. Philip Gibbard

Prof. D. M. Banerjee

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AWARDS & HONORS

Dr. Rajiv Nigam receives the 2022 - Josephs A Cushman Award !

1st Indian ever to be a recipient of this highest International Honour!!

Dr. Rajiv Nigam, a renowned micropaleontologist from India, associated with the National Institute of Oceanography in Goa, is a humble, kind, helpful and dedicated scientist. Dr. Rajiv Nigam is a marine geologist who graduated from Lucknow University with a Bachelor of Science and a Master of Science in Geology. Aligarh Muslim University awarded him a Master of Philosophy, Doctor of Philosophy, and Doctor of Science in Geology. He has been a recipient of the NORAD Diploma in Marine Micropaleontology from Oslo University as well. Dr. Nigam has made important contributions in the field of Marine Geology (Micropaleontology) by using foraminifera as a tool to better understand the oceanographic present, the past processes and their impact on the environment. Recently, Dr. Rajeev Nigam has been selected as a recipient of 2022 J.A. Cushman Award for his excellent work in foraminiferal research. He will receive this award in October 2022 during the Geological Society of America meeting in Denver, Colorado, USA. This decision was taken during the Annual Board of Directors meeting of the Cushman Foundation for Foraminiferal Research held at Portland, Oregon, USA, between October 10 and 13, 2021.

Dr. Rajiv Nigam is the first Indian Citizen who has been selected for this prestigious award for recognition of his lifetime contribution towards his work on foraminifera and its use as a proxy for marine pollution, culturing, archeology and marine geochemistry. In India, Dr. Nigam was the first to study foraminifera with a laboratory culture. These foraminiferal experiments were significant to our understanding of some of the most fundamental areas of foraminiferal research, such as the significance of foraminifera in pollution investigations. He's also spent a lot of time studying palaeomonsoon fluctuations and cyclicity, using morphogroups of benthic foraminifera as a new method to identify the 77-year cyclicity in average monsoonal rainfall, which is controlled by the Gleissberg solar cycle. His contribution to the field of paleodepth and sea-level curve reconstruction from India's east & west coasts is outstanding. Dr. Nigam has worked extensively in the field of marine archaeology, including resolving a dockyard controversy at Lothal; explaining Neolithic human settlements in the Gulf of Cambay [through knowledge of sea level fluctuations]; and reporting the thick wall [18 m] at Dholavira as India's oldest record of tsunami protection measures. His work in marine archaeology has received a lot of media attention.

Dr. Rajeev Nigam has received numerous awards including the CSIR Young Scientist Award, the Krishnan Gold Medal, National Mineral Awards, the Paleontological Society of India's M.R. Sahni lecture award, the Bhalla Gold Medal for excellence in Micropaleontology, and the Indian Geophysical Union's H.N. Siddiquie lecture award, among many others. Dr. Nigam is also passionate about human resource development and has successfully supervised 15 Ph.D. students as a certified guide of Goa University (Marine Science & Geology) and Professor of AcSIR. His students have excelled in the scientific field, winning 5 ISCA Young Scientist Awards, CSIR and INSA Young Scientist Awards, the National Mineral Award, the Krishnan Gold Medal, and other accolades. Dr. Nigam has over 160 research publications in national and international journals. Dr. Rajiv Nigam has been a scientist at the National Institute of Oceanography in Goa since 1978. He retired as the Head from the National Institute of Oceanography's Geological Oceanography Division and Marine Archaeology Unit. Later, he worked at NIO as an Emeritus Scientist.

The AOQR family congratulates Dr.Rajiv Nigam on his achievements!

Cushman Foundation for Foraminiferal Research
Est. 1950

Compiled by Dr. Pawan Govil
(Scientist, BSIP, Lucknow)

MINISTRY OF EARTH SCIENCES
GOVERMENT OF INDIA
NATIONAL AWARDS

AWARDS & HONORS

MoES LifeTime Excellence Award: ***Dr. Satish Shetye,*** *Former Director of the National Institute of Oceanography (NIO), Goa and Former VC of Goa University, for his exemplary work on Indian monsoons.*

National Award for Ocean Sciences: ***Dr. Sunil Kumar Singh,*** *Director, CSIR-NIO, Goa, received the National Award for Ocean Sciences.*

National Award for Atmospheric Science and Technology: ***Dr. R. Krishnan,*** *Scientist G and Executive Director, Centre for Climate Change Research, Indian Institute of Tropical Meteorology (IITM), Pune for Atmospheric Science and Technology. His research interests lie in the areas of Global Climate Change & Variability, Climate Dynamics pertaining to the Indian region and Dynamics & Variability of the Indian / Asian Monsoon.*

National Award in the field of Geoscience and Technology: ***Dr. Kalachand Sain,*** *Director, Wadia Institute of Himalayan Geology received the honour in the field of Geoscience and Technology.*

National Award in the field of Ocean Technology: ***Dr M.V. Ramanamurthy,*** *Director, National Centre for Coastal Research (NCCR), Chennai in the field of Ocean Technology.*

Anna Mani Award recognising woman scientists: ***Dr. Thara Prabhakaran,*** *Scientist F, IITM, Pune, and* ***Dr. Vandana Prasad, Director,*** *Birbal Sahni Institute of Palaeosciences, Lucknow.*
Dr. Thara Prabhakaran's expertise lies in the areas of meso- and microscale modeling and simulation, Boundary Layer Meteorology and cloud microphysics. Dr. Vandana Prasad's research interest lies in Evolutionary biology (early history of grasses), high resolution biostratigraphy, biotic turnover, paleoenvironment and relative sea level change during Late Cretaceous-Early Palaeogene and Quaternary palaeoclimatic studies using Dinoflagellate cysts, Palynofacies and Phytolith proxies.

Young Researcher Awards: ***Dr. Waliur Rahaman,*** *Scientist E, National Centre for Polar and Ocean Research (NCPOR), Goa, and Dr. Kandula V. Subrahmanyam, Space Physics Laboratory, ISRO.*

Certificates of Merit *were presented to*
Dr. Supriyo Chakraborty, *Scientist F, IITM, Pune;*
Dr. O.P. Sreejith, *Scientist E, IMD, Pune;*
Dr. Sudheer Joseph, *Scientist F, Indian National Centre for Ocean Information Services (INCOIS), Hyderabad;*
Dr. S.B. Pranesh, *Scientist E, National Institute for Ocean Technology (NIOT), Chennai;*
Dr. Avinash Kumar, *Scientist E, NCPOR, Goa;*
and ***Dr. S. Kaliraj,*** *Scientist C, NCESS, Thiruvananthapuram.*

Geological Society of India
In the cause of earth science in India

S. S. Merh Award - 2021

We are delighted to inform you that the Council of the Geological Society of India selected ***Dr. Sheikh Nawaz Ali,*** *Scientist (BSIP) for the Geological Society of India S.S. Merh Award for outstanding achievements in the field of Quaternary Geology for the year 2021 at its meeting on the 4th of August. We want to express our heartfelt congratulations on your accomplishments.*

PUBLICATIONS

Bisht and Rawat (2021) conducted their studies in the Yankti Kuti Valley in the upper Kali Ganga catchment and suggested multiple glacier advances since MIS 3. Their robust chronology and climatic evidence imply that the moisture-deficient valleys of semi-arid Himalayan regions respond sensitively to enhanced precipitation.

Tiju et al. (2021) investigate Quaternary sediments along the Kerala coast, and based on the multiproxy studies demonstrate that a stronger monsoon in the early Holocene led to the incursion of high-water levels, increased flow discharge and bottom scouring, but weak monsoon and arid climate prevailed during the Last Glacial Maximum.

Farooqui et al. (2021) carried out textural, petrological, mineralogical and multi-element geochemical investigations of a ~25 m sediment core from the lower reaches of the Mahi River basin and revealed the influence of climate and tectonics in the Gujarat Alluvial Plain over the last ~115 ka.

Singh and Kshetrimayum (2021) collected groundwater samples from three flow paths in the shallow aquifers of the Imphal valley and examined the variation in hydrochemical and rare earth element characteristics. Their study elucidated the behavioural change in major hydrochemical parameters which are critical in understanding the evolution of groundwater in terms of its quality, quantity, and origin.

Joshi et al. (2021) present the ~6500-250 cal year BP hydroclimatic record of two lakes viz the Tsoltak lake and the Yaya Tso near the Chang La and Hor La passes of the Ladakh Range. The authors discuss several wet and arid phases and their implications for both cultural transitions in the past as well as anthropogenic pressures in the future.

Phartiyal et al. (2021) for the first time have studied the corpoliths in the caves of Ladakh. The also review the last five thousand year climatic variations in this work in a palaeoecological and palaeoenvironmental context.

Shamurailatpam et al. (2021) use multiple proxies to link climate change and organic burial during the mid-Holocene period in the northwestern Himalayas. The authors discuss paleoenvironmental variations and further demonstrate that their records are comparable to other findings recorded in the Himalayan region.

Bhattacharya (2021) studies relict mudflats, coastal dunes and marine notches along the southern Saurashtra coast and identifies two events of high relative sea level (RSL). The author ascribes the mid-Holocene high RSL to the combined contribution of global ice melt & the strengthened Indian Summer Monsoon, whereas, the Late-Holocene high RSL is attributed to the Medieval Climate Anomaly.

Banerjee et al (2021) investigate a ~10 m sediment core from Vellayani Lake in Kerala and delineate the mid-late Holocene climate and sea level variability. Their results show that several pulses of monsoon intensification-reduction which had implications for the formation of a coastal lagoon system in the area.

Srivastava et al. (2021) investigate a sediment core collected from the Kali estuary to determine the vegetation distribution in the Western Ghats since the Late Holocene. Their results indicate the regional expansion of the agriculture post 3.5 ka, with the reduction in the taxonomic diversity of mangroves and arboreal taxa implying less-conducive environmental conditions for their growth.

Yadava et al. (2021) develop a metric of drought, extending back to AD 1773 using ring-width chronology of Himalayan cedar from Chakrata region, western Himalaya. Their findings underscore that a wide network of such large tree-ring based drought records from the data scarce Himalayan region should be very useful to understand the spatial distribution of droughts.

Luirei et al. (2021) provide an assessment of the tectonically induced Quaternary landforms and active deformation in the area between Main Boundary Thrust and Himalayan Frontal Thrust, south of the Siang Antiform, Arunachal Himalaya. They re-analyse the available GNSS results of the area, which indicate a deformation rate of up to 16 mm/year in the vicinity of the Pasighat region.

Tiwari et al. (2021) provide the hydrogeochemical characteristics of the Indus river water system, from the The hydrogeochemical diagrams, molar ratios, and statistical analysis in their study suggests that carbonate and silicates minerals' weathering mainly control the solute acquisition process with negligible contribution from anthropogenic sources in the waters in the Ladakh region.

Alappat et al., 2021 studied the sedimentary sequence of Coastal wetlands of central Kerala and found evidences of early- mid Holocene transgression in the area. The OSL and radiocarbon dating was used to establish the chronology and palynological studies were used to understand the vegetation dynamics. Dominance of wet evergreen forest taxa in the non-mangrove pollen of the peat indicates wet climatic conditions in the area. The occurrences of fossil wood stumps in the fluvial unit in the wetland stratigraphy shows evidences of enhanced SW monsoon in the area, causing large scale floods, submergence of forests and destruction of large trees during 5710–5610 and 6880–6750 Cal years BP.

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
Happenings in the Sub-continent
ASSOCIATION OF QUATERNARY RESEARCHERS

NEW RELEASE BOOK

REFERENCES

Banerji, U.S., Shaji, J., Arulbalaji, P., Maya, K., Mohan, S.V., Dabhi, A.J., Shivam, A., Bhushan, R. and Padmalal, D., 2021. Quaternary International.

Bhattacharya, F., 2021. Quaternary International, 599, pp.62-71.

Bisht, P. and Rawat, A., 2021. Quaternary Science Reviews, 273, p.107246.

Farooqui, S., Shah, A.P., Maurya, D.M., Archna, G., Ali, S.N. and Sharma, A., 2021. Applied Geochemistry, p.105088.

Joshi, P., Phartiyal, B. and Joshi, M., 2021. Quaternary International, 599, pp.45-54.

Luirei, K., Kothyari, G.C., Dumka, R.K. and Bhakuni, S.S., 2021. Geological Journal.

Shamurailatpam, M.S., Kumar, O. and Ramanathan, A.L., 2021. Quaternary International, 599, pp.55-61.

Singh, L.P. and Kshetrimayum, K.S., 2021. Geological Journal.

Srivastava, J., Manjunatha, B.R., Balakrishna, K., Prajith, A., Manjunatha, H.V., Jose, J. and Kumar, N., 2021. Quaternary International.

Tiju, V.I., Prakash, T.N., Nair, L.S., Sreenivasulu, G. and Nagendra, R., 2021. Journal of Asian Earth Sciences, 222, p.104952.

Yadava, A.K., Misra, K.G., Singh, V., Misra, S., Sharma, Y.K. and Kotlia, B.S., 2021. Quaternary International.

Phartiyal, B., Kapur, V.V., Nag, D., and Sharma, A. 2021. Quaternary International. 599, pp. 32-44

Tiwari, A.K., Singh A.K., Phartiyal, B. and Sharma, A., 2021. Chemistry and Ecology.

Linto Alappat, M. Frechen, S. Tsukamoto, K. Anupama, S. Prasad, P.G. Gopakumar, S. Sree Kumar, Evidences of early to mid-Holocene land–sea interactions and formation of Wetlands of Central Kerala in the south west coast of India, 2021, Regional Studies in Marine Science, Volume 48, 102009.

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. The membership of the AOQR is open to all individual of academia and industry, subject to verification.

Write to us at **aoqr2019@gmail.com** *for membership application form.*

You're Welcome!

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.

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

QC 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 all of you to register yourself for AOQR Membership and also 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**

TEAM QC WISHES A HAPPY NEW YEAR

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

Balance Sheet As on 31st March 2022

LIABILITIES		AMOUNTS Rs. P.	ASSETS	AMOUNTS Rs. P.
Capital Fund			**Current Assets, Loans & Advances**	
Opening Balance	390751.26			
Members Fee	66600.00		Bank Balance	457280.46
Less: Exps.over Income	-70.80	457280.46		
Total		**457280.46**	**Total**	**457280.46**

For ASSOCIATION OF QUATERNARY RESEARCHERS

President Seceratory

For Navdeep Maheshwari & Associates
Chartered Accountants

Navdeep Maheshwari
(Proprietor)
M.No.:419269

Place: Amroha
Date: 29/07/2023

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 31/03/2022

PARTICULARS		AMOUNTS Rs. P.		PARTICULARS		AMOUNTS Rs. P.
To Opening Balance			By	Expenses On AOQR		70.80
Cash	0.00					
Bank	390,751.26	390751.26	By	Closing Balance		
To Donation Received		0.00		Cash	0.00	
To MmbershipFees		66600.00		Bank	457,280.46	457280.46
		457351.26				**457351.26**

Income & Expenditure account for the year ending on 31/03/2022

To Bank Expenses on AOQR	70.80	By Excess of Expenses over Income	70.80
Total	**70.80**	**Total**	**70.80**

For Navdeep Maheshwari & Associates
Chartered Accountants

Navdeep Maheshwari
(Proprietor)
M.No.:419269

Place: Amroha
Date: 29/07/2023

For ASSOCIATION OF QUATERNARY RESEARCHERS

President **Seceratory**