Mapping of the Snout

Geological Survey of India teams have, more or less, regularly since 1935, been monitoring the snout of this glacier and, as a part of the monitoring activity, map of the snout front has been prepared (Fig.3) at various times. Comparison of the snout positions between 1935 and 1996 has revealed that the glacier front, especially the position of

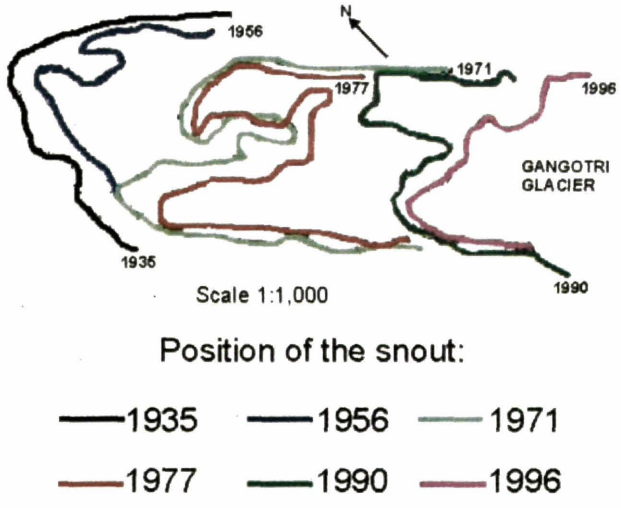

Fig.3. Relative position of the snout of the Gangotri glacier from 1935 AD to 1996 AD.

the ice cave Gaumukh, has been constantly changing and the glacier has retreated by about 1,100 metres during the period of 61 years (1935 to 1996), i.e. an average secular retreat of 18 metres a year.

A recent study, with the help of satellite imageries has revealed:

1. Position of the Gaumukh along the eastern limits has further retreated at an average of about 15 metres per year in 2001AD and 2002AD.
2. Raktvaran *nala* (melt water stream from the Raktvaran group of glaciers) that had been flowing sub glacially till up to 2002AD has eroded away the glacier ice on the eastern side and has now started flowing along the valley wall by passing the eroded glacier ice.

Life Span of the Gangotri Glacier

Spate of recent publications, especially on the internet, have come out with frightening prospect of this glacier vanishing from the surface of earth in immediate future. One publication has gone to the extent of giving 2035 as the last date. Field data does not, however, indicate any such catastrophe. Retreat of 15 to 18 metes or so per year is indeed thought provoking, but definitely not alarming. Let us not forget that some of the glaciers in Columbia and even in Alaska have recently shown an annual retreat of more than 200 metres.

This glacier is going to end one day and here I would, once again, like to refer to ancient classics, and the words of Bhagirath: "Ganga, one day shall be recalled to the heavens". Reading between the lines, it connotes the fact that even Bhagirath realised, thousands of years ago, that this glacier/river having come from the skies (heaven) shall one day retreat to the skies. If we assume that this glacier will continue to retreat, say at the rate of 15 to 18 metres a year, as it is doing at present, even then it will take almost 2,000 to 1,600 years for the glacier, so to say, to go back to the skies.

#258, Sector 17 V.K. RAINA
Panchkula - 134 109

THE RISE AND FALL OF THE VENDIAN BIOTA: IGCP - 493

The two-day Workshop on IGCP Project - 493 on Rise and Fall of the Vendian Biota was convened by Patricia Vickers–Rich, James Gehling and Mikhail Fedonkin (Project Leaders) in Monash University Centre at Prato, Italy from 30-31 August, soon after the 32 IGC held at Florence. The workshop was attended by the National Working Group memebers from Australia, USA, Canada, UK, Russia, Spain, Germany, Poland, Italy, Japan, South Africa, Namibia, India and Iran. Topics related to Ediacaran/Vendian biota were discussed including systematics, palaeoecology, taphonomy, stratigraphic and palaeogeographic distribution, palaeomagnetic calibration, radiometric dating and palaeoclimatic effects.

The International Union of Geological Sciences (IUGS) has ratified the new Ediacaran Period in 2004. The Ediacaran Period has been defined by an event recorded in a single section of rock outcropping termed the Global Stratotype Section and Point (GSSP). The IUGS ratified initial GSSP

of the Ediacaran Period lies at the base of a texturally and chemically distinctive carbonate layer that overlies glaciogenic rocks in an exposure along Enorama Creek in the Flinders Ranges, South Australia The end of the Ediacaran Period coincides with the beginning of the Cambrian Period In India, the Ediacaran Period corresponds to the Lesser Himalayan sedimentary sequnce of Krol Formation having Ediacaran biota, overlying glaciogenic Blaini Formation and underlying Lower Cambrian Tal Formation The workshop in two days discussed about the various aspects of the newly ratified global Ediacarn Period and its equivalants in other parts of the world

Twelve oral papers were presented on the first day dealing with calibration of animal evolution and environmental change across the Vendian/Ediacaran – Cambrian transition (palaeomagnetism, stable isotope geochemistry , geochronology and biostratigraphy) Evans and Raub (Yale University, USA) presented palaeomagnetic data on Ediacaran global reconstructions Tectonic features of the Ediacaran cratons show that Gondwanaland was assembling between 630 and 530 Ma At the same time, several passive continental margins developed from earlier rifts Four continental blocks have developed in Cambrian time namely, Gondwanaland, Laurentia, Baltica and Siberia K H Hoffmann (Namibia) discussed about the Neoproterozoic glaciations in Namibia and correlated the Chuos and the Ghaub glaciations with the global Sturtian and Marinoan episodes These correlations are based on negative carbon isotope excursions in cap carbonates associated with both intervals

Linnermann presented SHRIMP U/Pb dating and provenance studies of glaciomarine tillites and related sediments in Late Neoproterozoic rocks of Germany N M Chumakov (Russia) reviewed the global climate of the Vendian/Ediacaran Period His palaeoclimatic reconstructions indicate that during the Vendian there were atleast two glacial periods with a non-glacial period in between S M Jafri (Iran) discussed the Upper Vendian and Cambro – Ordovician stratigraphy of Northwest Iran with special reference to sedimentary facies , trace fossils and depositional environment Upper Vendian of Northern Iran is characterised by *Chuaria circularis, Tawuia and Vendotaenia* The Neoproterozoic– Cambrian transition in Spain with emphasis on Ediacaran stratigraphy was presented by Jensen (Spain) Finds of the skeletal fossil *Claudina hartmannae* in storm influenced platform carbonates of the Ibor Group suggest a latest Ediacaran age A terminal Ediacaran age is currently accepted for Cloudina in Namibia, South China, Oman, Western USA and Brazil

The author of this note represented India and discussed in detail about the rise and decline of the Vendian/Ediacaran biota and their palaeobiological and stable isotopic significance from the NW and NE Lesser Himalaya The decline of Meso–Neoproterozoic (Riphean) stromatolites after the Deoban stromatolitic carbonates, appearance of complex acanthomorphic acritarchs in the Infrakrol Formation (identical to the Dashauntuo Formation of China) and diversification of Ediacaran metazoans and metaphytes from the Krol Formation of the NW Himalaya after the Snow Ball Earth event (corresponding to the Blainian/Marinoan glaciation) have global implication This sequence from the Lesser Himalaya was also proposed earlier as one of the global GSSP for the Ediacaran Period (Terminal Proterozoic System) The cap carbonate with negative carbon isotope excursion is recognised in the top of the Blaini Formation and correlated with the GSSP Marinoan global glaciation In the NE Lesser Himalaya, the Buxa Dolomite in Arunachal and Sikkim areas is correlated with the Krol Formation of the NW Himalaya and the Sinian System of the Southrn China The Ediacaran palaeogeography, palaeomagnetism, biota and carbon isotope excursions strongly support this correlation in this region of Asia Nagayoshi Katsuta (Japan) presented a new image processing algorithm and computer programme to describe the striped pattern in cap carbonates from Rasthof Formation, Namibia, using an image processing lamination tracer This technique can be used in other cap carbonates of the world to correlate the striped (zebra) pattern Bunji Tojo (Japan) also discussed the origin of cap carbonate of the Neoproterozoic Otavi Group in Namibia analysing calcite – dolomite cycles using Scanning X-ray Analytical Microscope (SXAM)

K J Patterson (USA) based on his molecular clock estimation of metazoan divergence suggested that the last common ancestor of bilaterians arose 570 million years ago S Turner (Australia) presented an overview of the International recognition of the Ediacaran fauna and the contributions of Sprigg, Glaessner and Wade C Sprigg (1919 –1994) first recognised the Precambrian Ediacaran fossils in Australia from Flinders Ranges in 1946 In 1991, Geological Society of India also honoured the work of Professor Martin F Glaessner on Ediacaran biota and brought out a special publication "The World of Martin F Glaessner" (Geological Society of India Memoir 20, Edited by B P Radhakrishna in 1991)

The second day started with the case histories of the classical Vendian/Ediacaran fossil localities M A Fedonkin (Russia) presented evidences of cold climate and the evolution of metazoans in Vendian/Ediacaran localities in

siliciclastic palaeobasins of Avalon Peninsula, Newfoundland, Canada, the Flinders Ranges in South Australia , and the White Sea Region of Russia All these Ediacaran metazoan assemblages manifest the global expansion of animals after the most severe Neoproterozoic glaciations, which took place about 600 Ma ago G M Narbonne (Canada) discussed about the oldest Mistaken Point assemblage of Ediacaran fossils (575–560 Ma old) from Eastern Newfoundland, Canada He described the newly discovered exceptionally preserved soft bodied fossils from Spaniards Bay in the eastern Newfoundland (appeared on the cover of the international journal *Science*, 20th August, 2004) The rangiomorphs which dominated the Mistaken Point assemblage is not considered ancestral to any Phanerozoic or modern organism

Martin Brasier (UK) presented new methodology for the analysis of the geometry and biological relationship of Ediacaran fossils He does not consider any affinity of Ediacarans with the Pennatulacea The Precambrian – Cambrian transition in Northern Siberia was discussed by Jery Dzik (Poland) He identified the fossilised traces of the earliest infaunal animals Jim Gehling (Australia) described the new Ediacara Global Stratotype Section defined at the base of the Nuccaleena Formation in the Flinders Ranges National Park , South Australia This GSSP marks the end of a major glacial epoch This is a well exposed structurally uncomplicated, 3 5 km thick Ediacaran succession It preserves a primary palaeomagnetic record distinctive stratigraphic events and fossils of the Ediacaran biota at three well separated levels The Vedio film of the computer simulations of the Ediacaran biota was also shown by him, which gives an idea about the palaeoecology of that period M A Fedonkin (Russia) presented new data on *Kimberella*, the Vendian mollusc like organism from the White Sea Region of Russia with special reference to palaeoecological and evolutionary implications

Theresa Raub (Yale, USA) presented her view on the Australian Stirling and controversial Lower Vindhyan (Churhat) biota Though she has not examined the specimens, however, thinks that the Vindhyan biota (Seilacher et al in *Nature*) records 5-7 mm wide burrows in negative epirelief is challenged by the fine scale geometry of the most salient of its characteristic furrows However, Seilacher (Germany) still holds his opinion that these are not syneresis cracks but triploblastic animal impressions A Ivantsov (Russia) discussed Vendian animals (Phylum Proarticulata) in his presentation from Eastern Europe and South Australia Exceptionally large body size (> 1 m), unique body plan, complex morphology characterise them in a separate metazoan phyllum which existed only in the Ediacaran Period for example – *Dickinsonia, Vendia, Yorgia, Spriggina and Marywadea.* A Seilacher (Germany) described the garden of Ediacara as giant plasmoidial protozoans (Vendobionta and Xenophyophoria) that lived in benthic environment Cambrian revolution of life (explosive radiation) put an end to the Ediacaran world B Tojo (Japan) presented theoretical morphology of quilt structures in Ediacaran fossils (*Pteridinium simplex*) from Neoproterozoic Aar Farm in Namibia This new technique may be useful in understanding the mode of groth in real organisms The author of this note also presented the newly discovered Vendian non-mineralised demosponges (three types of extinct sponges) from the Buxa Dolomite of the Arunachal Lesser Himalaya, India This collaborative research (jointly with M Shukla and R Babu of B S I P, Lucknow and P Kumar, Zoology Department, Lucknow University) reports pore bearing metazoan (Porifera) for the first time from the Vendian / Ediacaran of India Sponges are the most primitive multicellular animals with a low grade of organisation and fixed to some submerged object in water It is suggested that ancient sponges may not have had a mineralised skeleton composed of spicules J Braun (Germany) described the siliceous microfossils (small shelly fossils and sponge spicules) from the Lowermost Cambrian sediments from Shaanxi area of China The abundance of sponge spicules in the Vendian and Lower Cambrian sediments of India and China indicate that Porifera Group must have played a major role in the biominerlisation

There were few poster presentations on Ediacaran acritarch biostratigraphy in Australia (Kathleen Grey), macrophytes and organically preserved microfossils in the Vendian complex of the southeastern White Sea area, Russia (Rogozina and Leonov) Ediacaria and Hiemalora – disc like attachments of organisms from the White Sea and Arctic Siberia (Russia) by Serezhinikova

Wadia Institute of Himalayan Geology, Dehradun VINOD C TEWARI

Email: *vinodt1954@yahoo co in*