10th Himalaya–Karakoram–Tibet Workshop, Switzerland, 1995 – Conference report

Since 1985, a series of international annual meetings on the geology of the Himalaya–Karakoram–Tibet region have been held: Leicester, UK (1985); Nancy, France (1986); London, UK (1987); Lausanne, Switzerland (1988); Milan, Italy (1990); Grenoble, France (1991); Oxford, UK (1992), Vienna, Austria (1993); and Kathmandu, Nepal (1994). The 10th Himalaya–Karakoram–Tibet Workshop was held at Monte Verità, Ascona city, in Switzerland on April 3–8 1995. This was the second time that the Swiss held the Workshop, and it was organized by David Spencer, Jean-Pierre Burg and Cinzia Cervato-Scapille of the Institute of Geology, Swiss Federal Institute of Technology (ETH), Zurich. A combination of several factors made this meeting very successful. The ETH geologists have a long record of research in the Himalaya. Augusto Gansser (now 85) is a pioneer Himalayan geologist. His book Geology of the Himalayas1 is a cornerstone of our geologic knowledge of the Himalaya. Gansser, former Chairman of the ETH Institute of Geology and now a retired Emeritus Professor, opened the Workshop with a fascinating talk on his 60 years of geologic work in various parts of the Himalaya, including his visit to the holy mountain of Kailash in 1936. Gansser and Arnold Helm (the son of the famous alpine geologist Albert Helm) published the results of their field work in Darjeeling, Kumaun and south Tibet in a treatise, Central Himalaya2, an original and pioneering piece of work.

The Workshop was well organized. It was held in a charming spot in Switzerland: the ETH Conference Centre at the Alpine hilly station of Monte Verità facing the blue lake of Maggiore. Fees for accommodation and food were subsidized. And more important, 25 participants came from the Himalayan countries—thanks to the fund-raising efforts of the conveners. Some 144 participants from 17 different countries in Europe, North America and Asia attended the Workshop.

The Himalayan Workshops are a timely response to increasing interest among geologists in the Himalaya and Tibet. With an area of some 2.5 million km², a mean elevation of 5000 m above sea level and crustal thickness of about 70 km, the Tibetan Plateau is the world's largest highland. Its geological genesis is still an enigma. The Himalaya bordering the southern margin of Tibet is the loftiest and youngest mountain chain on earth. These spectacular mountains hold crucial keys to understanding how mountains resulting from the collision of continental plates form. They are also linked in many ways to the ecology and life in south Asia. Rivers, rain-bearing monsoon clouds, and sediments coming from the Himalaya support agricultural communities, accounting for more than 10% of the world’s population; they are also responsible for the formation of the world's largest delta (the Ganges Delta) and the largest marine fan (the Bengal Fan). In recent years, it has also been suggested by Raymo et al.3 that the uplift and erosion of high mountains, especially the Himalaya–Tibet region, initiated the ice ages in the northern hemisphere during the past 3 million years. This is possible because high rates of chemical weathering and denudation absorb atmospheric carbon dioxide. This hypothesis was recently featured in a BBC documentary entitled 'Tibet: The Ice Mother', which was also shown at the Workshop.

It was, therefore, appropriate that a special session of the Workshop (with 10 oral presentations) be devoted to 'Geological processes related to uplift, exhumation and elevation of the Himalaya, Karakoram and Tibet'. This author began the session by presenting a sequential history of the uplift and denudation of the Himalaya throughout the Cenozoic, and emphasizing that the rise of the Himalaya seems to have occurred episodically in several distinct phases rather than a steady-rate slow history, a single big boom or merely chaotic events here and there. A one-hour Discussion Meeting had also been scheduled to discuss informally 'The mechanisms and consequences of Tibetan plateau uplift', led by Peter Molnar, a geophysicist who has been pondering on the geodynamic evolution of the Himalaya and Tibet since the early 1970s (Molnar and Tapponnier's influential paper4 in Science is a must to read). During discussions on the uplift history, it seemed that two major ideological camps among Himalayan researchers exist: those who confine the uplift of the Himalaya and Tibet to the Miocene epoch (23–5 Ma) (e.g. Molnar), and those who also add a major Quaternary (the past 1.6 million years) phase of uplift to this history (e.g. Gansser).

We know that the Himalaya grew out of the closure of the Tethyan Ocean, which once lay between India and Asia. We also know that the initial boundary between the Indian and Asian tectonic plates, along which Tethys was consumed and subsequent India–Asia collision took place, is represented by the Indus–Tsangpo Suture Zone, first suggested by Gansser in 1964. But the timing of this collision is controversial. Richard Beck of the University of South California presented a summary of his research group's recent paper5 in Nature presenting stratigraphic evidence from the Indus Suture Zone in Pakistan that the collision took place between 65 and 57 million years ago (Ma) at least in northwestern Himalaya. Previously, Searle et al.6 had argued that the collision was at 50 Ma. Another one-hour discussion was devoted to 'The timing of the India–Eurasia collision', headed ably by Searle and Beck. Much stimulating discussion followed, and with a mood of 'back to the basics', the very definition of 'continental collision' was questioned. 'Continental collision' goes through an early stage of 'ocean floor termination', i.e. when the basaltic ocean floor is completely consumed by the process of subduction, and a later 'continental suturing', i.e. when the shallow marine faces changes into purely continental sedimentation. Beck defined the 'collision' as the former, and Searle as the latter. But why not consider both of them as initial and end
members of continental collision?—
ocean floor termination initiating the
deformation of the colliding continents,
prominently involving the accretionary
prism, although shallow marine sedi-
mentation is still going on, and contin-
ental suturing giving rise to land
conditions at the site of the collision.
There may be a time span of several
million years between these two events.
In other words, drifting and converging
continental plates ‘hit’ each other before
they actually ‘meet’ each other.

The Himalaya as we know consists of
a series of fold-and-thrust belts. The
backbone of these mountains is the
Central Crystalline Zone of the Higher
Himalaya, which has thrust over the
Lesser Himalayan sediments and low-
grade metamorphosed sediments along
an orogen-scale rupture known as the
Main Central Thrust (MCT). Some 20
years ago, Le Fort proposed a model
according to which simultaneous meta-
orphism and thrusting along the MCT
brought ‘hot’ rocks of Higher Himalaya
over the ‘cold’ Lesser Himalaya, caus-
ing an ‘inverted metamorphism’, i.e.
metamorphism temperature-pressure
conditions increasing upwards the
mountains. This model was put forward
to answer the enigma of inverted meta-
orphism in the Himalaya, first ob-
observed by several geologists in the late
19th century. There are, however, sev-
eral other models to explain inverted
metamorphism, including granitic in-
trusions in the Higher Himalaya, differen-
tial thrusting of each metamorphic
zone, large-scale folding of metamor-
phic isograds, and ductile shearing dis-
tributed across the Central Crystalline
rocks. Several talks addressed these
issues, and a one-hour Discussion
Meeting was devoted to ‘20 years of
MCT models—Which ones work?’
It seems that to relate the Himalayan in-
volved metamorphism to the MCT a
clear definition of the MCT along the
strike of the Himalaya is required (Mr.
X’s MCT in Garhwal may be entirely
different from Mr. Y’s MCT in Nepal
and hence confusing debates) and then
it should be considered whether the
MCT is a unique single structure in
terms of Himalayan metamorphic his-
tory or rather a wide zone of multiple
thrusts and shearing. Systematic
thermochronological and thermobarometric
data across the Higher Himalaya are
also required to address the ‘puzzle’ of
inverted metamorphism. In the end, we
may find that each model, like the four
blind men in the famous Indian parable,
touches a certain aspect of ‘the el-
phant’ and conveys some but not all of
the truth, of course with all the likeli-
ness that some of the models are more
truthful than others.

John Ramsay, a well-known structural
geologist who succeeded Gansser at the
ETH Institute of Geology and is now
retired (himself succeeded by Jean-
Pierre Burg, a convener of the Work-
shop) gave an overview of the discus-
sions during the four-day Workshop.
Ramsay remarked that as Emile Ar-
gand’s 1916 map of the western Alps
has changed little after eight decades,
Gansser’s 1964 geological map of the
Himalaya is essentially valid to this
day. What aspects of Himalayan geology
may be expected to yield novel discoveries
in the future? From the standpoint of
structural geology, Ramsay emphasized
the need to study the deformation his-
tory within the geological divi-
sions of the Himalaya rather than merely
viewing each orogen-scale division as an
intact unit.

The Abstract Volume was published
as No. 298 issue of Mitteilungen aus
dem Geologischen Institute, ETH (349
pp). A proceedings volume of the Work-
shop containing selected, referred pa-
pers is scheduled to be published in
Tectonophysics in 1996. A total of 48
oral presentations were made in 10 ses-
sions: Tectonics and Palaeoclimate (2
talks), Southern Tibet (4), Tibetan Pla-
teau (3), Himalayas of Pakistan and
India (14), the Main Central Thrust (4),
Central and Eastern Himalaya (14),
Asian tectonics (4), and Applications
of geochronology in the Himalaya (3).
Some 52 posters were displayed and
each poster was given three minutes to
convey its main message, which was a
good strategy to handle poster presenta-
tions. Overall, the coverage of topics
was well balanced, although at the end
of the Workshop there was criticism
that usually in the Himalayan Workshops
much attention is paid to ‘hard rock’
geology, while many important clues to
understand the evolution of the Him-
laya are hidden in its sedimentary record
(‘soft rock’ geology). Interestingly, this
criticism was made by two stratigraph-
iers, Aymond Baud (Switzerland) and
aurizio Gaetani (Italy) as well as by a
lactonist, Vikram Thakur (India).

Most of the Indian participants at the
Workshop came from the Wadia Insti-
tute of Himalayan Geology (Dehra Dun)
and the Birbal Sahni Institute of Pa-
laeobotany (Lucknow), which are, in my
opinion, two of the best geoscientific
research institutions in India, aptly
named after the great Indian scientists:
D. N. Wadia (1883–1969) and Birbal
Sahni (1891–1949). India with its vast
resources in Himalayan geology should
try to hold one of the Himalayan Work-
shops in the future—before the new
millennium begins!

1. Gansser, A., Geologie of the Himalayas,
Interscience, London, 1964, pp 289
Helv. Sci Nat., 1939, 73(1), 1–245
(Reprinted by Hindustan Publ Corp.,
Delhi, 1975)
3. Raymo, M., Ruddiman, W. F. and Froelich,
4. Molnar, P. and Tapponnier, P., Science,
55–58

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