

Memorial to Augusto Gansser (1910–2012)

RASOUL SORKHABI

University of Utah, Energy and Geoscience Institute, Salt Lake City, Utah 84108, USA

The renowned Swiss geologist and GSA honorary fellow Augusto Gansser passed away in his hometown of Massagno in Lugano district, southern Switzerland, on 9 January 2012, at age 101. Gansser was born on 28 October 1910 in Milan, Italy, where his father, a Swiss businessman, and his mother, a German, were then living. Four years later, the family moved to Lugano where Augusto went to school and grew up in the shadow of the Alps. He later recalled that, at age seven on a family vacation to the Alpine town of Andermatt, he happened to find a large piece of quartz in the foundation of the Furka Oberalp railway, and that crystal triggered his early interest in rocks and mountains.

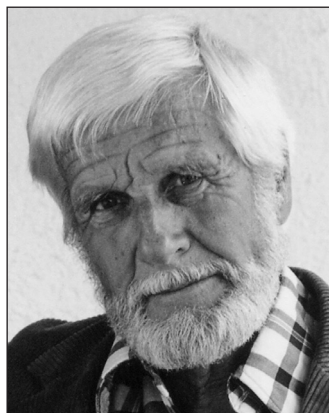
Gansser studied geology at the University of Zürich. As a member of the Swiss Alpine Club, in 1934 he joined a four-month Danish expedition to east Greenland led by Lauge Koch. Their ship ran into difficulties, and Gansser returned to Zürich to continue his doctorate degree under the supervision of Professor Rudolf Staub (1890–1961). He also briefly worked as an instructor at the Geological Institute, Zürich, then headed by Staub.

In 1936, the Zürich geologist Arnold Heim (1882–1965) invited Gansser to join him on the first Swiss expedition to the Himalayas funded by the Swiss Science Society. This eight-month journey was the beginning of Gansser's lifelong passion for geologic work in the Himalayas. The region Heim and Gansser mapped was in the central Himalaya of India bordering Nepal and Tibet. The results of their field trips and observations were published in two well-written books: a travelogue titled *The Throne of the Gods* and a research volume *Central Himalaya: Geological Observations of the Swiss Expedition 1936* (1939).

A highlight of Gansser's journey was his visit, disguised as a pilgrim, to the sacred Mount Kailash in southern Tibet (then forbidden to foreigners), located in an area that is the source of the major Himalayan rivers: the Indus, Sutlej, and Yarlung-Tsangpo (Brahmaputra). He later commented that on this arduous trip he could hide his hammer, compass, and camera under his Tibetan cloak (*chuba*), but "the only thing I could not hide were my blue eyes." In the Kali valley on the India-Nepal border, Gansser mapped a basement rupture line, what he called the Main Central Thrust, whose significance as a major structure bringing the high-grade metamorphosed rocks (gneiss and schist) of Higher Himalaya atop the sediments and low-grade metamorphosed rocks of Lesser Himalaya has been increasingly recognized by further studies.

Superb field photographs and stylish sketches of landscape, structures, and stratigraphic sections, making profound geologic inferences from field relations, giving priority to facts and observations rather than to arm-waving theories, and blending regional geologic work with a compassionate curiosity toward local cultures and peoples, as reflected in the young Gansser's 1936 Himalayan work, remained characteristics of his work throughout his life.

In 1937, Gansser returned to Lugano, and married Linda Biaggi, a champion swimmer, who was also known as Toti. The couple spent their honeymoon driving and camping in Morocco.



Gansser then joined Shell and went to work in Colombia where he lived until 1946, unable to return to Switzerland during World War II. He conducted mapping and field work in the Andes, and later published several papers on this region. During their stay in Colombia, Gansser immortalized his wife by naming a 5000-m peak Pico Toti because while climbing it together she had fallen down a slope but had been saved by her rope.

In 1947, Shell transferred Gansser to Trinidad where he lived for three years. In 1951, Gansser joined H. Huber and A. Heim in Iran, all working for the National Iranian Oil Company. He mapped the little-known central and northern parts of the Persian Plateau on foot and using aerial photographs, and published an influential paper at the World Petroleum Congress held in Rome in 1955. The most dramatic part of Gansser's work in Iran was his involvement in the discovery of oil near the town of Qom in northern Iran far from the well-known Zagros petroleum basin in the southwest of the country. Oil trapped at 3000 m beneath a salt cap was hit by the fifth "wildcat" well on 26 August 1956, but the oil gusher was too overwhelming. Erupting about 120,000 barrels of crude per day to a height of 52 m (the largest oil gusher on record, according to *The Guinness Book of World Records*), a black oil lake hazardous to the environment soon formed. Two weeks later, fire was set to the oil lake, and after three months the well was shut down.

Gansser left Iran in 1958 to take up a joint position of professor of geology at the University of Zürich and the Swiss Federal Institute of Technology (ETH). Nevertheless, his interest in the geology of Iran continued; he was a co-author of *Salt Diapirs of the Great Kavir, Central Iran*, a Memoir published by the Geological Society of America in 1990.

Gansser proved to be a popular professor at Zürich: His classes were based on enthusiastic presentation of his own field studies; he was fluent in several European languages; and the geologic sketches which he drew on the blackboard with both right and left hand (he was ambidextrous) captivated the students' imagination. From his new base at Zürich, Gansser conducted geologic research in the Alps and also rejuvenated his work in the Himalayas. In 1964, he published his seminal book, *The Geology of the Himalayas*. Gansser was one of the first geologists who applied the plate tectonic theory to the evolution of mountain belts, specifically the Himalayas—thanks to his upbringing in Alpine geology where a "mobilist" tectonics characterized by thrust sheets, fold nappes, and compressional forces had been worked out by Swiss geologists such as Hans Conrad Escher von der Linth and his son Arnold, Albert Heim and his son Arnold (Gansser's mentor), and Emil Argand decades before the theory of plate tectonics.

Gansser identified the Indus-Tsangpo Suture Zone, a lineament running along the river courses of Indus and Tsangpo in southern Tibet as the plate boundary between India and Asia, based mainly on his observations of ophiolites in that region in 1936. Over the years, in a series of papers, Gansser articulated a field data-based tectonic scenario for the evolution of the Himalayas, which influenced generations of Himalayan geologists and still remains largely a valid interpretation.

From 1963 to 1977, Gansser made five field trips to Bhutan; his friendship with Bhutan's royal family definitely contributed to the success of his pioneering geologic work in that remote country. Gansser's 1983 book *Geology of the Bhutan Himalaya* (dedicated to the "memory of HM King Dorji Wangchuck") and his 1994 color map of Bhutan at the scale of 1:500,000 lay the foundation of our geologic knowledge of this little-known Buddhist kingdom. Gansser's fascinating photographs of Bhutan have also decorated two coffee-table books, *Bhutan: Land of Hidden Treasures* (1971) and *The Dragon Kingdom: Images of Bhutan* (1988).

In 1979, when India opened the remote regions of Ladakh and Zaskar in northwest Himalayas to foreign visitors, Gansser (although already retired in 1977) along with several geology students at Zürich conducted important research in that region and published several key

papers on the origin of the Andean-type Trans-Himalayan magmatic belt that was a precursor to the India-Asia collision and the eventual uplift of the Himalayas.

Gansser visited Tibet in 1980 at the invitation of the Chinese leader Deng Xiaoping to participate in an international symposium on Tibet; in 1985 he revisited Tibet on a joint British-Chinese expedition.

For his pioneering geologic exploration in several mountain belts, Gansser received a number of awards, including the Patron's Medal of the Royal Geographical Society (London), the Wollaston Medal of the Geological Society (London), the Prix Gaudry of the Geological Society of France, the Steinmann Medal of the Geological Society of West Germany, and the King Albert Medal of Merit (Belgium). Gansser was an honorary fellow of the U.S. National Academy of Sciences, Accademia Nazionale dei Lincei (Rome), the Geological Society of India, and Nepal Geological Society. Perhaps the honorary title of "Baba-ye Himalaya" (Father of the Himalaya) given to him by the University of Peshawar (Pakistan) in 1983 best describes the significance of Gansser's lifelong work in these highest mountains.

Gansser's motivation for geologic research and writing and his brilliant thinking as a natural scientist, even late in his life, was remarkable. In 1990, he published a monograph on cup stones, which he had observed in various parts of the world. These cup shapes fashioned in stones come in various sizes and were used by prehistoric peoples; and the question of their various functions has intrigued archaeologists for years. Gansser's book, which he updated in a bilingual German-English edition in 1999, is an important contribution to this aspect of geoarchaeology.

The Ganssers had four daughters (Ursula born in 1941, Manuela, 1949, Francesca, 1956, and Rosanna, 1959) and two sons (Mario born in 1943, and Luca, 1945). In 2000, Gansser's beloved wife died. Linda Biaggi-Gansser had kept diaries and notes of their long life journey, which formed the basis for a biographical work, *La maglie di un geologo: Augusto Gansser* (second edition, 2000). In January 2012, upon his death, Gansser was cremated with his hammer placed along with his body—not merely as a beautiful gesture for the wonderful life of a great field geologist but also to fulfill a last wish of his: "Instead of flowers, I would like a geologist's hammer." His ashes were scattered by his family members into a stream in an Alpine valley where he used to play as a child.

SELECTED BIBLIOGRAPHY OF AUGUSTO GANSSER

- 1937 (doctoral thesis) Der Nordrand der Tambodecke: Geologische und petrographische Untersuchungen zwischen San Bernardino und Splügenpass: Schweizerische Mineralogische und Petrographische Mitteilungen, v. 17, p. 291–523.
- 1938 (with Heim A.) Thron der Götter: Erlebnisse der ersten Schweizer Himalaya-Expedition: Mogarten-Verlag, Zürich/Leipzig, 270 p. [English translation by Eden Paul and Cedar Paul, 1939: *The Throne of the Gods: An Expedition to the Himalayas*: London and New York, Macmillan, 233 p.; reprinted in 1994 by Book Faith India, Delhi]
- 1939 (with Heim, A.) Central Himalaya: Geological Observations of the Swiss Expedition 1936: Zürich, *Memoires de la Société Helvétique des Sciences Naturelles*, v. 73, no. 1, 245 p. [Reprinted in 1975 by Hindustan Publishing Corporation, Delhi., with an introduction by K.S. Valdiya.]
- 1950 Geological and petrographical notes on Gorgona island in relation to northwestern S. America: *Schweizerische Mineralogische und Petrographische Mitteilungen = Bulletin Suisse de Mineralogie et Petrographie*, v. 30, p. 219–237.

- 1954 The Guiana Shield (South America): Geological observations: *Eclogae Geologicae Helvetiae*, v. 47, p. 77–112.
- 1955 Ein Beitrag zur Geologie und Petrographie der Sierra Nevada de Santa Maria (Kolumbien, Südamerika): *Schweizerische Mineralogische und Petrographische Mitteilungen = Bulletin Suisse de Mineralogie et Petrographie*, v. 35, p. 209–279.
- 1955 New aspects of the geology in central Iran: Proceedings of the Fourth World Petroleum Congress, Rome, Section I/A/5, Paper 2, p. 279–300.
- 1960 Über Schlammvulkane und Salzdomme: *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zuerich*, v. 105, no. 1, p. 1–46.
- 1962 (with Dal Vesco, E.) Beitrag zur Kenntnis der Metamorphose der alpinen Wurzelzone, Schweiz: *Schweizerische Mineralogische und Petrographische Mitteilungen = Bulletin Suisse de Mineralogie et Petrographie*, v. 42, p. 155–168.
- 1962 (with Huber, H.) Geological observations in the central Elburz, Iran: *Schweizerische Mineralogische und Petrographische Mitteilungen = Bulletin Suisse de Mineralogie et Petrographie*, v. 42, p. 583–630.
- 1963 Quarzkristalle aus den kolumbianischen Anden (Südamerika): *Schweizerische Mineralogische und Petrographische Mitteilungen = Bulletin Suisse de Mineralogie et Petrographie*, v. 43, p. 91–103.
- 1964 *Geology of the Himalayas*: London and New York, Wiley-Interscience Publishers, 289 p.
- 1964 (with Dal Vesco, E.) Bericht über die Exkursion B der Schweizerischen Geologischen Gesellschaft: SE-Gotthardmassiv und Penninikum (Piora-Lukmanier-Bleniotal): *Mitteilungen aus dem Geologischen Institut der Eidgenössischen Technischen Hochschule und der Universität Zürich*, n. F. 35.
- 1964 (with Gyr, T.) Über Xenolithschwärme aus dem Bergeller Massiv und Probleme der Intrusion: *Eclogae Geologicae Helvetiae*, v. 57, p. 577–598.
- 1966 Geological research in the Bhutan Himalaya, *in The Mountain World*: Zürich, Swiss Foundation of Alpine Research, p. 87–97.
- 1966 Iran, *in Catalogue of the Active Volcanoes of the World Including Solfatar Fields*: Rome, International Association of Volcanology, v. 17, p. 1–20.
- 1966 The Indian Ocean and the Himalayas: A geological interpretation: *Eclogae Geologicae Helvetiae*, v. 59, p. 831–848.
- 1968 The Insubric line, a major geotectonic problem, *in Symposium 'Zone Ivrea-Verbano'*: *Schweizerische Mineralogische und Petrographische Mitteilungen = Bulletin Suisse de Mineralogie et Petrographie*, v. 48, p. 123–143.
- 1969 The Alps and the Himalayas, *in Himalayan and Alpine Orogeny*: New Delhi, Report of the Twenty-Second International Geological Congress, 1964, Part XI, Proceedings of Section 11, p. 387–399.
- 1969 (text by Blanche C. Olschak, photography by Ursula Gansser and Augusto Gansser) *Bhutan - Land der verborgenen Schätze*: Bern / Stuttgart: Verlag Hallwag, 112 p. [English translation, 1971: *Bhutan: Land of Hidden Treasures*: New York, Stein and Day; London, George Allen & Unwin, 144 p.]
- 1969 The large earthquakes of Iran and their geological frame: *Eclogae Geologicae Helvetiae*, v. 62, p. 443–466.
- 1970 Lunana, the peaks, glaciers and lakes of northern Bhutan, *in The Mountain World*: Zürich, Swiss Foundation of Alpine Research, p. 117–131.
- 1971 The Taftan Volcano (SE Iran): *Eclogae Geologicae Helvetiae*, v. 64, p. 319–344.

- 1973 Facts and theories on the Andes: Twenty-sixth William Smith Lecture (with generalized geological map of the Andes 1:20,000,000): *Journal of the Geological Society of London*, v. 129, p. 93–131.
- 1973 Orogene Entwicklung in den Anden, im Himalaya und den Alpen, ein Vergleich [Orogenic evolution in the Andes, Himalayas and the Alps; a review]: *Eclogae Geologicae Helveticae*, v. 66, p. 23–40.
- 1974 Himalaya, in Spencer, A.M., ed., *Mesozoic-Cenozoic Orogenic Belts: Data for Orogenic Studies: Geological Society of London Special Publication 4*, p. 267–278.
- 1974 The Himalayan Tethys: *Rivista Italiana di Paleontologia e Stratigrafia, Memoria*, v. 19, p. 393–411.
- 1974 The ophiolitic melange: A worldwide problem on Tethyan examples: *Eclogae Geologicae Helveticae*, v. 63, p. 479–507.
- 1974 The Roraima problem (South America), in *Contributions to the Geology and Paleobiology of the Caribbean and Adjacent Areas: Mitteilungen aus dem Geologischen Institut der Eidgenössischen Technischen Hochschule und der Universität Zürich*, v. 177, p. 80–100.
- 1974 (with Termier, G.) Les séries dévoniennes du Tang Chu (Himalaya du Bhoutan) [The Devonian series of Tang Chou, Bhutan Himalayas]: *Eclogae Geologicae Helveticae*, v. 67, p. 587–596.
- 1977 The great suture zone between Himalaya and Tibet: A preliminary account, in *Himalaya: Sciences de la terre: Colloques Internationaux du Centre National de la Recherche Scientifique 268*, v. 2, p. 181–191.
- 1977 (with Frank, W., and Tromsdorff, V.) Geological observations in the Ladakh area (Himalayas): A preliminary report: *Schweizerische Mineralogische und Petrographische Mitteilungen = Bulletin Suisse de Mineralogie et Petrographie*, v. 57, p. 89–113.
- 1979 Ophiolitic belts of the Himalayan and Tibetan region, in Irwin, W.P., Dietrich, V.J., Knipper, A.L., and Gansser, A., eds., *International Atlas of Ophiolites (International Geological Correlation Programme, Project Ophiolites): Geological Society of America Map and Chart Series 33*, p. 13–15.
- 1979 Reconnaissance visit to the ophiolites in Baluchistan and the Himalaya, in Farah, A., and de Jong, K.A., eds., *Geodynamics of Pakistan: Quetta, Geological Survey of Pakistan*, p. 193–213.
- 1979 The Himalayas—A fascinating geological challenge: *Episodes*, no. 4, p. 17–20.
- 1979 The ophiolitic suture zones of the Ladakh and the Kailas region: A comparison: *Journal of Geological Society of India*, v. 20, p. 277–281.
- 1979 (with Varnham, M.) Bhutan: Himalayan Kingdom: Royal Government of the Kingdom of Nepal, 48 p.
- 1980 Tectogenesis of the Himalaya, in *Geologie des chaines alpines issues de la Tethys—Geology of the Alpine Chains Born of the Tethys: 26th International Geological Congress, Paris, Mémoires du B.R.G.M.*, v. 115, p. 312–313.
- 1980 The division between Himalaya and Karakorum: *Proceedings of the International Committee on Geodynamics Group 6 Meeting: Geological Bulletin of the University of Peshawar*, v. 13 (special issue), p. 9–22.
- 1980 The Peri-Indian suture zone, in *Geologie des chaines alpines issues de la Tethys—Geology of the Alpine Chains Born of the Tethys: 26th International Geological Congress, Paris, Mémoires du B.R.G.M.*, v. 115, p. 140–148.
- 1980 The significance of the Himalayan suture zone: *Tectonophysics*, v. 62, p. 37–52.

- 1981 The geodynamic history of the Himalaya, *in* Gupta, H.K., and Delany, F.M., eds., *Zagros-Hindu Kush-Himalaya—Geodynamic Evolution*: Washington, D.C., American Geophysical Union, Geodynamic Series 3, p. 111–121.
- 1981 The timing and significance of orogenic events in the Himalaya, *in* Geological and Ecological Studies of Qinghai-Xizang Plateau: Beijing, Science Press, v. 1, p. 23–30.
- 1981 (with Dietrich, V.) The leucogranites of the Bhutan Himalaya (crustal anatexis versus mantle melting): *Schweizerische Mineralogische und Petrographische Mitteilungen = Bulletin Suisse de Mineralogie et Petrographie*, v. 61, p. 177–202.
- 1981 (with Dietrich, V.J., Sommerauer, J., and Cameron, W.E.) Palaeogene komatiites from Gorgona Island, East Pacific: A primary magma for ocean floor basalts?: *Geochemical Journal*, v. 15, p. 141–161.
- 1981 (with Pantic, N.K. and Hochuli, P.A.) Jurassic palynomorphs below the main central thrust of East Bhutan (Himalayas): *Eclogae Geologicae Helvetiae*, v. 74, p. 883–892.
- 1982 (with Burgisser, H.M., and Pika, J.) Late glacial lake sediments in the Indus valley area, northwestern Himalayas: *Eclogae Geologicae Helvetiae*, v. 75, p. 51–63.
- 1982 (with Honegger, K., Dietrich, V., Frank, W., Thöni, M., and Trommsdorff, V.) Magmatism and metamorphism in the Ladakh Himalayas (the Indus-Tsangpo suture zone): *Earth and Planetary Science Letters*, v. 60, p. 253–292.
- 1983 *Geology of the Bhutan Himalaya*: Zürich, Mémoires de la Société Helvétique des Sciences Naturelles, no. 96, Birkhauser Verlag, Basel, 181 p.
- 1983 The morphogenic phase of mountain building, *in* Hsü, K.J., ed., *Mountain Building Processes*: London, Academic Press, p. 221–228.
- 1983 *The Wider Himalaya: A Model for Scientific Research*: Munksgaard, Kommission, 30 p.
- 1983 (and Blattner, P., and Dietrich, V.) Contrasting ^{18}O enrichment and origins of High Himalayan and Transhimalayan intrusive: *Earth and Planetary Science Letters*, v. 65, p. 276–286.
- 1983 (text by B.C. Olschak, photography by U. Markus-Gansser and A. Gansser) *Bhutan: Konigreich Im Himalaya*: Freiburg, Atlantis, 104 p. [English translation by Michael H. Kohn, 1988, *The Dragon Kingdom: Images of Bhutan*: Boston, Shambhala, 106 p.]
- 1987 (with Olschak, B.C., Gruschke, A., and Bühler, E.M.) *Himalaya: Wachsende Berge, lebendige Mythen, wandernde Menschen* (German): Luzern, Motovun Verlagsgesellschaft. [English translation by K. Badger, J.A. Deleay, and J. Nykiel, 1987, *Himalayas: Growing Mountains, Living Myths, Migrating Peoples*: New York and Oxford, Facts on File, 288 p.]
- 1988 (with Pantic, N.) Prealpine events along the eastern Insubric Line (Tonale Line, northern Italy): *Eclogae Geologicae Helvetiae*, v. 81, p. 567–577.
- 1990 Cup-stones, prehistoric cult-objects: *Atti della Accademia nazionale dei Lincei, Roma, anno 387, Memorie Lincee, Scienze fisiche e naturali, ser. 9, v. 1, fasc. 3., 95 p.*
- 1990 (with Jackson, M.P.A., Cornelius, R.R., Craig, C.H., Stocklin, J., and Talbot, C.J.) Salt Diapirs of the Great Kavir, Central Iran: *Geological Society of America Memoir* 177, 139 p.
- 1991 Facts and theories on the Himalayas: *Eclogae Geologicae Helvetiae*, v. 84, p. 33–59. [Reprinted in the *Journal of the Geological Society of India*, 1994, v. 46, p. 487–508.]
- 1991 John Bicknell Auden (1903–1991): *Journal of the Geological Society of India*, v. 37, p. 613–617.
- 1992 The enigma of the Persian salt dome inclusions: *Eclogae Geologicae Helvetiae*, v. 85, p. 825–846.

- 1993 The Himalayas seen from Bhutan: Jahrbuch der Geologischen Bundesanstalt Wien, v. 136, p. 335–346.
- 1994 Enigmas of Vatulele Island: La Buona Stampa (Printer), Switzerland, 99 p.
- 1994 Geological Map of the Bhutan Himalaya: Boston, Massachusetts, Birkhauser-Verlag, scale 1:500,000, 1 sheet.
- 1995 Hands: Prehistoric visiting cards?: München, Verlag Dr. C. Müller-Straten, 168 p.
- 1997 Bhutan, *in* Moores, E.M., and Fairbridge, R.W., eds., Encyclopedia of European and Asian Regional Geology: London, Chapman & Hall, p. 83–86.
- 1999 Schalensteine: Prähistorische Kult-Objekte: München, Verlag Dr. C. Müller-Straten, 163 p.
- 2000 La Macarena: Massagno, Switzerland (self-published).
- 2000 La moglie di un geologo: Augusto Gansser (2nd ed.): Massagno, Switzerland (self-published), 236 p.
- 2002 Inside the Walls: Persia during the Fifties: Massagno, Switzerland (self-published).
- 2004 Amarcord: Massagno, Switzerland (self-published).



