

# Princeton University

HONORS FACULTY MEMBERS  
RECEIVING EMERITUS STATUS



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The biographical sketches were written by staff and  
colleagues in the departments of those honored.

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*In the Nation's Service and the Service of Humanity*

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# GERTA KELLER



Gerta Keller, professor of geosciences, transferred to emeritus status in July 2020, having served thirty-six years on the Princeton faculty. Her life story reads like an adventure novel and her academic story is almost as exciting. As *The Atlantic* reported in an article about Gerta in 2018, “She has crisscrossed dozens of countries doing field research and can claim near-death experiences in many of them: with a jaguar in Belize, a boa in Madagascar, a mob in Haiti, an uprising in Mexico.” Most recently, a bus accident in India caused both a broken ankle and a brain embolism; Gerta did not allow either injury to slow her down very much.

Gerta was the sixth of twelve children in a Swiss farming family. She attended a public school in a small village in the Alps, which may have contributed to her early interest in rocks. In this idyllic environment, the children worked the farm as the family tried to make ends meet. From a young age, Gerta was smart and ambitious, and aspired to educational and professional opportunities not open to women of that place and time.

At age twelve, Keller wanted to become a doctor but was apprenticed with a dressmaker instead. In 1964, at age nineteen, Keller quit her job in Zurich and took off on a trip that would eventually take her around the world. Her adventures included nearly dying of hepatitis, nearly being sold into slavery, working as a nurse’s aide and a waitress, and being shot by a bank robber in Australia. She later settled in San Francisco where, at age twenty-four, she returned to school. She began at a community college and later transferred to San Francisco State University, where she majored in anthropology. She attributes her interest in mass extinction to a geology class in her junior year. She became the first member of her family to graduate from college, and was one of the first women to receive a Ph.D. in earth sciences from Stanford University in 1978. After a brief postdoctoral appointment at Stanford, Keller worked at the United States Geological Survey (USGS) in Menlo Park, California, and at Stanford. She joined the Princeton faculty in 1984 as a visiting associate professor. In 1985, she became an associate professor, and since 1992, she has been a full professor.

Keller’s primary research interests focus on major catastrophes in Earth history, including the biological effects of mass extinctions, meteorite impacts, major volcanic eruptions, rapid climate change, ocean acidification, and oceanic anoxia events. Her research integrated

paleontology, biostratigraphy, geochronology, sedimentology, and geochemistry in reconstruction of past environmental changes associated with or leading up to mass extinctions and major evolutionary turnovers. Most of this work relies on analysis of foraminiferan fossils, or tiny carbonate shells that represent the remains of marine organisms. Using taxonomic, chemical, and isotopic signatures preserved in these fossils, Keller has been able to document the timing and rate of environmental change on Earth's surface.

In the 1970s and 1980s, Keller's work focused on the planktonic foraminiferal biostratigraphy and paleoceanography of various sites in the Pacific Ocean. The central theme of her life's work—using foram records to determine the cause of mass extinctions—began in the mid-eighties. She is best known for research on a catastrophe that occurred about 66 million years ago, which led to the extinction of nearly 75 percent of Earth's species. This event marks the boundary between the Cretaceous and Paleogene periods (the K-Pg boundary), which is best known in the popular imagination as the death of the dinosaurs. The K-Pg boundary is the Earth's most recent mass extinction, and as such is most amenable to modern research; it is also the most controversial in the scientific arena.

The cause of the mass extinction and death of the dinosaurs 66 million years ago had been debated for decades, but the prevailing hypothesis was published by Walter Alvarez in 1980: a giant asteroid crashed into the Yucatan Peninsula spreading rock dust into the stratosphere and around the globe, which rapidly caused the death of most life forms during a devastating "nuclear winter."

Keller was one of few scientists whose work has consistently supported the contention that the impact of a gigantic meteorite, although disruptive to climate and life on Earth, was not the reason for the mass extinction at the K-Pg boundary. Since the introduction of Alvarez's impact theory, such challenges have placed Keller well outside of the mainstream of geology. Her meticulous and prolific work over the intervening years, however, based largely on microfossil stratigraphy while also incorporating new isotopic methods, has chipped away at the monolithic consensus. She has documented geological evidence that the mass extinction and impact dates do not coincide, and argues instead that the extinction was driven by catastrophic volcanism that covered the entire western half of what is now India. Her first paper on Deccan Traps volcanism, in 2008, provided unprecedented evidence of huge lava flows just before the extinction traveling a thousand kilometers into the ocean, where they are now interbedded with foram fossils that had evolved only after the extinction of the previous fossil assemblage.

Her work in India required forging partnerships with government and industry to obtain access to samples and field sites. This work has earned her recognition and honors in India, where she was awarded the Radhakrishna Prize for the best paper published in the journal of Geological Society of India for the year 2011. The paper chosen for this prize, “Deccan Volcanism Linked to the Cretaceous-Tertiary Boundary Mass Extinction: New Evidence from ONGC Wells in the Krishna-Godavari Basin,” challenges the impact theory of mass extinctions. Keller has been honored with more honorary degrees and distinguished lectureships around the world than can be enumerated here.

In the last several years, a collaboration with Associate Professor of Geosciences Blair Schoene, whose specialty is high precision dating of ancient rocks, led to groundbreaking papers that establish the timing of the K-Pg extinction events with greater precision than ever before and demonstrate that the massive volcanism in India at the time was a significant, and perhaps major, contribution to those extinctions. When their first paper was published in *Science Online* in December 2014, the journal also ran a multipage profile on Gerta and the controversy, which was the first time that *Science* has acknowledged the possibility that the impact theory might not be the only explanation for the extinctions.

This has been a very long, very high-profile controversy. The controversy still rages, but as the philosopher of science Thomas Kuhn has pointed out, changing paradigms is traumatic, and even the best paradigm cannot explain all the facts. Regardless of how this debate turns out, Gerta has almost singlehandedly held the majority accountable and has published a prodigious amount of data that inform not only this debate but also the interpretation of geological, biogeochemical, and evolutionary records around the globe.

Gerta's publication list runs to nearly 300 articles, about half of which address the asteroid impact/volcano controversy. For many years, she taught a popular class on mass extinctions, which took students on field trips around the world. These expeditions not only taught geosciences, but also exposed students to different cultures and the exigencies of life in remote and uncomfortable conditions. Many undergraduates have described these field trips as life-changing experiences. Keller has also provided guidance and tremendous learning and research opportunities for a steady stream of graduate students, several of whom now hold academic positions in the U.S. and abroad. For example, her former graduate student Jahnvi Punekar has gone on to be the first (and still only) female professor in the Department of Earth Sciences at India's prestigious Indian Institute of Technology Bombay. The impact of Keller's work is immense and long-lasting, in the geosciences and beyond.