# Memorial to Thomas Patrick Miller 1936–2022

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Our friend and colleague, Thomas Miller, passed away on 3 September 2022 at the age of 86. Tom retired from the U.S. Geological Survey (USGS) in 2002 following a distinguished 41-year career and remained emeritus until 2018 when he moved with his wife, Shirla, to Arizona; Shirla passed away in 2021.

Tom Miller at a workshop dedicated to the 50th anniversary of the 1956 eruption of Bezymianny Volcano in Kamchatka, Russia, March 2006. Photo by A. Sokorenko (Institute of Volcanology and Seismology).

Tom grew up in the northern Minnesota city of Duluth. He earned a B.S. degree in geology and mining engineering from the University of Minnesota at Duluth in 1958 and an M.S. degree from the University of Minnesota at Minneapolis in 1961; those years included a field season in Antarctica.

In 1960, Tom passed the USGS national qualifications test and was offered a job either on the Kentucky Mapping Project or the Nevada Test Site; Tom chose Kentucky. After two years working in Kentucky, he transferred to the Branch of Alaskan Geology in Menlo Park, California. From 1963 to 1967, Tom served as geologist on the Hughes-Shungnak Project, with an emphasis on igneous rock petrology. From 1967 to 1972, he served as chief of the Hogatza Heavy Metals Project, studying mineralization on the west coast of Alaska.

While working full-time, Tom entered Stanford University, earning a Ph.D. in 1971; his specialty was plutonic rocks. However, he soon grew more interested in magma that breached the surface and was funded by the Geothermal Research Program to inventory and study hot springs, which led him into the Volcano Hazards Program. For six years, he partnered with Robert L. Smith and learned the basics of volcanology, specifically explosive processes that produced pyroclastic flows. In 1972, Tom moved to the Branch of Alaskan Geology's Anchorage office. In 1975, Tom was put in charge of the office.

Tom began working on late Quaternary volcanoes on the Alaska Peninsula and in the Aleutian Islands in 1973, studying petrogenetic and emplacement processes at more than nine Aleutian caldera centers. At that time, very little work had been done on most of these volcanoes.

Some of his most important achievements include dating the major, catastrophic, caldera-forming eruptions and increasing by over 50% the known Holocene volcanoes that erupted more than 5 $km^3$ of material in individual events. His refined chronologies and calculations of eruption volumes became invaluable volcanic eruption responses.

Tom also carried out studies on thermal springs in non-volcanic areas of Alaska and devised a still-accepted model for non-volcanic thermal springs in Alaska.

As part of a regional mapping program in west-central Alaska, Tom identified a major belt of ultrapotassic alkaline intrusive complexes that extends more than 1300 km across western Alaska and into Russia.

In 1980, the USGS decided that the branch should be headquartered in Anchorage, rather than in Menlo Park, and that Tom would be the branch chief. Some younger members of the branch chose to transfer up to Alaska, and Tom began hiring a dozen new geologists. Tom led the Alaska Mineral Resource Appraisal Program (AMRAP) and played a seminal role in growing the USGS geoscience and mineral resource expertise in Alaska. Tom's recruitment efforts included a cohort of excellent women scientists, a significant step forward for gender diversity in the USGS.

As Branch of Alaskan Geology Chief from 1980 to 1985, Tom oversaw and led geologic mapping projects throughout Alaska. He also led the move of the branch from three offices to a single one on the campus of Alaska Pacific University.

While overseeing AMRAP work, Tom continued his studies of Alaskan volcanoes. In March 1986, Augustine Volcano erupted, and ash began wafting over upper Cook Inlet and the Kenai Peninsula, disrupting air traffic and commerce. At that time, there was no USGS volcano observatory in Alaska, and Tom was instructed to "act" like an observatory, wherein he was to be the federal representative for the response. Thus, he and colleagues mounted a month-long aerial surveillance of the activity and distributed information to federal, state, and local governments, as well as the public and media.

Following the 1986 Augustine eruption, Tom met with the University of Alaska Fairbanks and the Alaska Division of Geological and Geophysical Surveys to address the hazards from volcanoes to south-central Alaska, resulting in the formation of the Alaska Volcano Observatory (AVO) in 1988, with Tom as the scientist-in-charge. During the next six years, Tom became a leader in global efforts to reduce the risk of volcanic ash to aviation in the wake of the 1989–1990 Redoubt Volcano eruption—which produced an ash cloud that nearly brought down a large commercial airliner due to ingestion of ash into the engines. This vital work took him to the Far East of Russia in the 1990s, where he co-founded the Kamchatka Volcano Eruption Response Team (KVERT). To this day, KVERT works closely with AVO to mitigate the risk of volcanic ash to aircraft in the North Pacific Air Route Corridor. Tom's work with Russian colleagues to establish KVERT was acknowledged in 2002 when he was awarded the Alaska-Siberia Lend-Lease Award.

Tom played a major role in addressing the hazard of volcanic ash to aviation, serving as a USGS consultant to airlines, aviation groups, and government agencies. Tom and Tom Casadevall authored a 2000 paper, "Volcanic ash hazards to aviation," considered to be the standard reference on the topic.

Tom produced over 139 peer-reviewed publications during his career. One of his most cited was the 1977 *Geology* article co-authored with Robert L. Smith: "Spectacular mobility of ash flows around Aniakchak and Fisher calderas, Alaska." Tom's geothermal work was summarized in the 1994 GSA volume *The Geology of Alaska*. Tom was the lead editor of the *Journal of Volcanology and Geothermal Research* issue documenting the 1989–1990 eruption of Redoubt Volcano, and he had several significant papers in the *USGS Bulletin* documenting the 1992 eruption of Spurr Volcano. Tom was also instrumental in the creation of the Aviation Color Code system of describing volcanic activity, a scheme now utilized worldwide by volcano observatories.

Tom accumulated a rich list of awards and honors over his career, including the Antarctic Service Medal, the USGS Meritorious Service Award, and a Shoemaker Communications Award. Tom's contributions were a major factor in AVO receiving the Vice President Gore "Hammer Award" in 1996 for AVO's response to volcanic hazards to aviation. Finally, Tom received the Distinguished Service Award, the highest award given by the U.S. Department of Interior.

After retiring in 2002, Tom continued working with AVO as scientist emeritus for 16 years. His vast knowledge of Alaska's volcanoes and regional geology and his experience responding to eruptions across decades of technological and organizational change made him a valued resource to the new generations of AVO staff.

There are endless wonderful Tom Miller stories, from his unexpected overnight stay inside the Mount Veniaminof caldera, to co-creating the aviation color code on a napkin, and scaling 4700-m-high Klyuchevskoy Volcano with Russian colleagues. We remember Tom's commanding presence and decisive leadership. Tom has left a lasting and profound mark on the USGS, Alaska geology, volcano-risk mitigation, and many careers. We note his passing with affection and fond memories.

Two, one-hour video interviews of Tom Miller (2015, 2016) are archived at the USGS Office of Communications; Don Becker, USGS Video Archive Manager/Archivist, becker@usgs.gov, +720-891-8693.

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