DISTINGUISHED GEOLOGIC CAREER AWARD (MGPV DIVISION)

Presented to
Peter Lipman

Peter Lipman
U.S. Geological Survey
(Emeritus Scientist)

Citation by Olivier Bachmann

Peter Lipman is the first recipient of the GSA MGPV Career Achievement award. This is richly deserved and a great start for this award. Pete's pioneering and innovative work on large volcanic systems, should it be silicic caldera-forming eruptions or giant shield volcanoes, set the tone for much of the work that has been done over the past half century, and this award is allowing us to pause and reflect on how much we owe to Pete for all this hard work.

Pete's career started at a most exciting time for a geologist. Pete was finishing his Ph.D. at Stanford when Harry Hess's published his landmark paper on sea-floor spreading, setting up the stage for the plate tectonics theory to puzzle the earth science community. And it was also just as several seminal papers by Bob Smith on ash flows appeared, which were break-through explorations of processes at large caldera-forming explosive eruptions (now commonly referred to as "supervolcanoes") on our planet. As a fresh "Doc in rocks", Pete started working at the Nevada Test Site, only to realize that this place was covered with giant ash-flow deposits that meshed wonderfully with Smith's interpretations. Then, in order to obtain better perspectives on younger units, he managed to spend a year in Japan as an NSF post-doctoral fellow, to study one of the largest Quaternary caldera-forming eruptions, the Aso Tuff. Japan during 1964-65 must have been a great adventure for a couple of young westerners (his wife Beverly was with him for the whole time), and it left great memories and influences, with Japanese art and life-style hints still surrounding their lives many decades later.

Studying the gigantic ash-flow units in Nevada and Japan led Pete to one of his first major discoveries: that many of these deposits came out of the ground strongly zoned in composition and mineralogy. Both the Aso system and the Nevada Test Site units show obvious signs of being erupted from complex magma reservoirs in the shallow crust, and understanding how and why these reservoirs behave this way has kept a lot of us igneous petrologists and volcanologists busy for the last 50 years.

Pete's volcano studies moved east in 1965 and landed in a wonderful land of opportunity, Colorado(!), and more specifically the San Juan region (now recognized as the largest erosional remnant of the composite Southern Rocky Mountain Volcanic Field). With his usual efficiency, Pete started field work in the San Juan as soon as the jet lag was over, two weeks after moving back from Japan. By 1968, as French hippies were swarming the street of Paris, Pete and his colleagues were swarming all over southern Colorado in a whirlwind of mapping that has not stopped, as he was in the Colorado mountains until a few weeks ago to continue fieldwork. By a complex combination of intense mapping, advanced petrology, geochronology, and geophysical techniques, Pete and colleagues realized the southern Colorado had been a Tertiary hot plate, with almost 30 large caldera-forming ignimbrites erupted in a few million years during what is called now the western USA magmatic flare-up. Their careful unraveling of the magmatic history of this region took many years, enormous energy, creative thinking, and the most state-of-the-art techniques in geochemistry (including early isotopic determinations in the mid seventies), but I believe that Pete has laid out for us in incredible detail one of the best examples of a continental-arc magmatic province. I can't resist noting that it also contains the only magnitude-9 eruption documented on our planet (based on Mason et al. 2004). We actually don't know if this unit, the Fish Canyon Tuff, which Pete and my other mentor Mike Dungan allowed me to look at, is really the largest ignimbrite on Earth, but being in the USA and largely put on the map by Pete, it probably ought to be.

Each large magmatic province has its advantages, but the one that stands out in the SRMVF is the intermediate degree of erosion and the great amount of topographic relief (hard on the legs and lungs but scientifically advantageous). It allowed Pete to see calderas structures like few places on Earth. The great dissection by glacial valleys exposes ring faults, densely welded intracaldera facies, resurgent domes, and tops of the plutonic roots of these caldera cycles. This led to the discovery of "megabreccias" near walls of the calderas, a major advance in understanding the geometries and construction of these structures. It also allowed Pete and field geologists in other areas of the world to avoid becoming totally bewildered by Nature's tricks while mapping. Caldera landslide breccias can expose all kinds of lithologies, cropping out with unexpected attitudes and in places where they shouldn't be. Without the mental framework that km-sized blocks can slide, rotate and land kilometers away from where they started, a field geologist can rapidly go totally crazy.

After about a decade of working in southern Colorado, I can only assume that Pete got slightly tired of being stormed upon and chased by lightning every summer, and decided to get involved in studying volcanoes under balmier skies. His first work on Kilauea and Mauna Loa appeared in the late 1970's, and Pete has been back there for many decades, mapping the subaerial and submarine flanks of these fabulous volcanoes with colleagues from all over the world, including Japanese ships and submersibles that would take them to sea-floor depths to observe the gigantic landslides that take away from time to time the flanks of the Hawaiian volcanoes. He also had the good taste of acquiring a share in a wonderful house on the sunny side of Big Island, a delightful idea for some of us, who are just a short flight away from this tropical paradise.

I was fortunate to join Pete in the mid-1990s for a series of epic summers in the SRMVF to continue unraveling the histories of these supervolcanoes. Pete has been a fabulous mentor to me (and to many others young volcanophiles), not only with respect to his approach to science but also his approach to living. Volcanoes, although clearly a big part of his life, are balanced with his great family and interests far from erupting mountains. Probably few of you know that Pete is a great art enthusiast (he

was the president of the San Jose Museum of Art for several years), wine aficionado (he has one of the most amazing wine collections that I know), a world connoisseur (he loves to travel), and one of the few volcanologists who walks faster than his shadow. Pete, I want to thank you for allowing me to be here today, for everything you have done for our science, and congratulate you again heartily for this richly deserved award.

References:

Mason BG, Pyle DM, Oppenheimer C (2004) The size and frequency of the largest explosive eruptions on Earth. Bulletin of Volcanology 66:735-748

Response by Peter Lipman

Thank you, Olivier, for such kind words.

And I find it difficult to express my delight, both by this award and by creation of the MGPV Division. As a field-based geologist involved in the spectrum of MGPV activities, I've now been a GSA member of for 50 years. But no Division previously had been much of a fit for studies of volcanoes and their eruptive processes. So thank you Jim, Cathy, and the others who have finally filled this gap at GSA.

As a kid who grew up in a rural part of southern New England, visible rocks were uninteresting, mainly on walls separating abandoned farm fields—think of Robert Frost's poem "Mending Wall," and I was a slow starter.

My geologic adventures have repeatedly been blessed by the luck to be in a good place at the right time, and especially to have connected with wonderful people. Additionally, the explosion of concepts and techniques for study of volcanic activity has been just extraordinary during the past 50 years. Here are examples:

A college friend told me about a camp-counselor job on the slopes of Pikes Peak in Colorado, I applied, and at age 19 ventured west of the Hudson River for the first time (a 14-yr-old in my camp tent was geology-prof-to-be, Bud Wobus). Seeing western mountains like the Tetons inspired a desire to explore them, and when I joined the college climbing club, I found myself tied to a rope with geology majors like Eric Cheney and Steve Porter.

When I belatedly decided that rocks could be interesting, midway through my junior year, the Yale geology department let me enter the second-half course without having taken Physical Geology (I'd read the textbook during the holidays). Upon switching to a geology major, I found myself in a class of only six, including such quick studies as geochemist Dick Armstrong and mineralogist Mike Holdaway, where there was no way to hide without doing the course work.

Yale had no summer field course of its own, and waived this requirement when I obtained a field-assistant job with Ben Leonard of the USGS, in a wonderfully geologically diverse mountainous area of central Idaho. Ben was a meticulous scientist and superb teacher; my field methods were largely shaped during that summer.

During my initial year as a grad student at Stanford, I shared an office with Bob Christiansen and became the first grad student supervised by Bill Dickinson, both life-long friends. And Bill allowed me to start a PhD field project after only two quarters of class work, on igneous and metamorphic rocks in the Trinity Alps, northern California. When Mike Holdaway, by then at Berkeley, discovered that fellow grad student Greg Davis was headed for the same area, the three of us collaborated on adjacent theses, with improved results for all. But igneous petrology in the late 1950s at Stanford involved techniques little different from those pioneered in late 19th century Germany; so much has changed since!

When offered a job by the USGS in late 1961 to work on volcanic rocks at the Nevada Test Site, I went for it because the rocks were well exposed, and at least igneous, even though I knew little about volcanic terranes. Here again, luck and timing: the rocks turned out to be world-class ignimbrites and calderas, ripe for study with new concepts (especially just-published papers by Robert L. Smith) and innovative analytical techniques including major- and trace-element chemistry in quantity, K-Ar age determinations, and paleomagnetic pole directions for testing stratigraphic correlations.

Deciding that volcanic rocks were fascinating but concerned by my inexperience with young volcanism, I (in hindsight, utterly brashly) wrote Hisahi Kuno (then probably the foremost volcanic petrologist globally, but whom I had never met) at the University of Tokyo, asking to do a postdoc with him. He said "yes," I obtained funding from a new NSF program, and had an amazing year following the youngest Aso ignimbrite from caldera rim, down a paleovalley, 70 km to the ocean. This work would not have been possible without guidance from Kuno's extraordinary assistant, Shigeo Aramaki and wonderful collaborations with two recent Kuno students, Koji Ono and Kazu Nakamura.

While in Japan, I was invited to participate in quarter-million-scale remapping of the San Juan Mountains, a USGS effort being organized by Tom Steven - the beginning of another long-term collaboration and friendship. A new style of mapping for me, averaging a 7.5' quad per week—but a terrific opportunity to explore huge areas, commensurate with the enormous ignimbrites and calderas. Even so, the scale of Fish Canyon Tuff (>5,000 km^3) and La Garita caldera (75x35 km) were utter surprises!

Fortunate opportunities kept coming: the developing concepts about plate tectonics in late 60s, just as Bob Christiansen, Hal Prostka, and I were recognizing regional volcano-tectonic trends for the American Cordillera. There was more San Juan work in the early 1970s, in conjunction with Wilderness Area studies, that included helicopter support and opportunities for more detailed work on Platoro and Lake City calderas, and informative Pb, Sr, and O isotopic tracer studies (with Bruce Doe, Carl Hedge, and Irving Friedman) on caldera-related magmatic evolution. Then work as staff geologist at the Hawaii Volcano Observatory, just in time for the M=7.2 Kalapana earthquake (largest in 100 years) and new experiences with follow-up geodetic surveys, followed by mapping and by radiocarbon dating the prehistorical activity of Mauna Loa, eruptions of Kilauea in 1977 and Mauna Loa in 1984, and new collaborators - especially Jack Lockwood, Bob Tilling, and Gordon Eaton. Then eruptive and geodetic study of the amazing 1980 Mount St. Helens eruption, jointly with Jim Moore and Don Swanson, and a large summary publication edited jointly with Donal Mullineaux. More mainland caldera studies aimed at exploring the connection with granitic remnants of subvolcanic magma chambers at Questa, New Mexico, and Mesozoic systems in Arizona. Work with the USGS Marine Geology group, especially Bill Normark, to explore the landslide submarine flank of Mauna Loa; framework geology for the Creede Scientific Drilling Project, led by Phil Bethke in the late 1980s. Fieldwork with Russians at Lake Baikal and young volcanic rocks in the Caucasus and Armenia, during five separate summers bracketing amazing societal changes as the Soviet Union wound down.

After a couple years away from research as Branch Chief and manager of the USGS Volcano Hazards and Geothermal Programs, back to the San Juans in 1995, where jointly with Michael Dungan, Olivier, and others from the Université Genéve, we explored the Fish Canyon Tuff and its enormous caldera.

Then in 1997-2002, Japanese scientists initiated an amazing collaborative effort to study underwater slopes of Hawaiian volcanoes, using submersibles provided by the Japan Marine Science and Technology Center (JAMSTEC). In recent years, mapping and petrologic study of additional diverse ignimbrites and calderas farther northeast in the San Juans that bridge to older Tertiary volcanism in central Colorado, aided by superbly precise Ar-Ar age control provided by Bill McIntosh and associates at New Mexico Tech.

In addition to collaborations with many university faculty and several postdocs, I've had marvelous times with some terrific grad students, serving on about 10 dissertation committees. And I owe so much to many wonderful guys who assisted with fieldwork so many summers in southwestern Colorado and elsewhere--to name just a few that came back for more than a single summer: Russ Burmester, Dave Johnson, John Pallister, Dave Sawyer, Olivier Bachman, and Andrea Sbisa.

It's been a wonderful trip, these past 50 years or so, with so many innovations in concepts and techniques, so much beautiful country for fieldwork, and shared experiences with so many lively associates. In all of these, I am enormously indebted to USGS management that has provided flexible support for activities that often deviated from perceived bureaucratic procedures. And most of all, to Beverly and our two sons, who often accompanied me in the field and on geology-related trips, at many times under less-than-idyllic conditions.

A final plea, though: the need for intensive field-based geologic studies. Mapping continues to be an essential research tool to identify questions and resolve hypotheses. Successful lab work depends on well-characterized samples and stratigraphy, but field relations remain poorly constrained in so many areas I've worked. So much remains to be learned, even in a place as extensively studied as the Southern Rocky Mountains, and this past summer's fieldwork continues to define fascinating questions to explore with lab work this winter. It's been a great time; stay in touch, or better still, come join in the fun!

And thank you again for this much-appreciated award.