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A career in coalitions: forging linkages among scientists, society, and the natural world

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Introduction

Geology through a child's eyes

My home state of Pennsylvania is ribbed by interlocking ranges of the Appalachian Mountains and flanked on its southeastern corner by gentle hills and coastal plain. A lifelong fascination with geology began with family camping trips to rugged terrain in the American West. Observing geological features was a joy that became a hobby and then a career aspiration. My decisive career moment happened at the age of 12 while charmed by the complexities of upturned and faulted sedimentary rock layers at the Dinosaur National Monument in Utah/Colorado, United States.

Journey out of restrictive cultural norms

During the 1950s and 1960s, a perception persisted that professional career opportunities for women were limited to nursing, secretarial work, or school teaching. I was accepting of that arrangement because through the narrow lens of school studies, cultural norms, and as the daughter of an educator, earth science secondary school teaching appeared achievable and acceptable. Adjacent to university courses required for degrees (BS and MS degrees at Bloomsburg and Shippensburg State Universities of Pennsylvania), I enrolled in multiple field courses in geology and glaciology. The additional coursework raised my confidence in the ability to conduct scientific work. Yet, the immediate need to earn a living led me to teach eighth-grade earth science for three long years before the imperative to conduct science eclipsed my desire to teach it. In the Summer of 1978, at a time when few articles published in two seminal glaciology journals had female authorship (Hulbe et al., 2010), I began a summer of glaciology fieldwork for the U.S. Geological Survey (USGS), and unknown at the time, a 44-year multi-disciplinary career. My recent retirement affords time for reflection.

Backdrop for a career in coalitions

My involvement in scientific work began in 1978 at the USGS Project Office-Glaciology in Tacoma, Washington, United States, in support of glacier monitoring in Alaska and the American West and with developing chronologies of Mount Rainier's glaciers (Driedger, 1986). Two projects motivated by eruptions at Mount St. Helens examined the dimensions of glaciers on the Cascade Range volcanoes and the impacts of volcanic ash on the snowpack

(Driedger, 1980; Driedger and Kennard, 1986). Studying ice-marginal and sub-glacial discharges at Alaska's Columbia Glacier (Meier et al., 1980; Walters et al., 1988) was a career highlight. When the Glaciology office closed in 1986, as a victim of budget cuts, I transferred to the nearby USGS Water Resources District Office where multiagency coalitions were highly valued and their development was expected of all personnel. The mandate prompted me to initiate a long-term study of Mount Rainier glacier-generated debris flows which were damaging park infrastructure (Driedger and Fountain, 1989; Walder and Driedger, 1995). This project caught the attention of scientists at the relatively new USGS Cascades Volcano Observatory and resulted in an invitation to join their staff. The move was a career nexus because work involved glaciers, volcanoes, hazards, and science communication. It coincided with the passage of Washington State's Growth Management Act (Washington State Legislature, 1990). Public officials contacted the USGS frequently to obtain information of volcano hazards. This resulted in an extensive network of interagency professional relationships. Later, engagement with public officials in volcano hazard working groups and with professional information distributors (news media, community and educators, and visitor information specialists) created an informal and transdisciplinary regional coalition—a Volcano Risk Management System (VRMS) in the Cascade Range (Wright et al., 2023), built upon the professional missions of each member organization and desired by all for effective risk mitigations.

Coalitions empower science

Coalitions and long-term collaborations can be viewed as the beating hearts of scientific endeavors that pump expertise and transdisciplinary ideas throughout a project, inspire a broad exploration of scientific questions and solutions, and empower its full capabilities. Transdisciplinary approaches are critical because they transcend boundaries between academic cultures and engage members in mutual learning and with lived reality. Research projects that are transdisciplinary incorporate stakeholder knowledge in the development of initial research plans and final deliverables, thereby ensuring societally robust products and solutions rather than purely scientific analyses (Nowotny, 2003; Hirsch Hadorn et al., 2008; Perry et al., 2016). Involvement in coalitions can aid early-career researchers during the simultaneous interplay of career and self-development (Modestino et al., 2019).

Transdisciplinary coalitions have introduced me to scientists of many disciplines and to public officials, communicators, and citizenry. I have learned science and leadership skills, modeled others' research approaches, work ethics, and methodologies, and recognized the information needs of multiple professions. Coalitions have granted me long-term friendships and increased empathy and understanding of the world. My assertions are based upon experiences within coalitions noted in the following sections.

1975—ongoing Mount Baker and Mount St. Helens response coalitions

An ad hoc volcanic unrest response established academic relationships that became fundamental to future coalitions.

Five years before the catastrophic eruption of Mount St. Helens, and 270 km farther north, thermal anomalies at Mount Baker caught the attention of an *ad hoc* assembly of governmental and university scientists. This transdisciplinary coalition worked in a semi-coordinated manner by conducting surveillance, developing hypotheses, and advising public officials and the news media (Frank et al., 1977). This team became a scientific nucleus for the 1980 response group at Mount St. Helens (Wright et al., 2023). In 1980, I witnessed Mount St. Helens' catastrophic debris avalanche and eruption, and within that first hour, I was recruited by colleagues to aid the response to news media inquiries. In the eruption aftermath, scientists who arrived by the dozens established their own research projects. This encouraged me to develop my own project, namely, spreading ash to varying thicknesses on plots of clean snow to explore how ash affects albedo and snow-melt rates (Driedger, 1980). For a geologist, the catastrophic eruption of Mount St. Helens should have been exhilarating, but the loss of 57 lives troubled me and predisposed me to work in hazards communication later in my career at the USGS Cascades Volcano Observatory. Public officials and other scientists became similarly motivated and through time developed a well-organized, multi-agency incident response strategy that strengthened the response to Mount St. Helens' 2004–2008 eruption (Driedger et al., 2008; Frenzen and Matarrese, 2008; Driedger and Westby, 2020).

1980s—Columbia Glacier research program

This cross-academia coalition integrated scientific insights about a disintegrating tidewater glacier in Alaska. After disaster struck, stakeholders formed their own coalition.

The Columbia Glacier research program began during the late 1970s when the USGS Scientist Austin Post observed evidence of accelerated glacier thinning, calving, and an expanding flotilla of icebergs that threatened oil tankers, which carried oil southward from the southern terminus of the Alaska Pipeline. USGS Project Office-Glaciology cast a broad net beyond its small office staff and established a coalition of modelers, mathematicians, hydrologists, oceanographers, and seismologists to assess the rapidly changing situation. Earlier coalition work led to the 1980 prediction of increasing glacier instability and iceberg formation and to some mitigative actions by the U.S. Coast Guard (Meier et al., 1980). Still, mitigation measures failed. On 24 March 1989, news headlines announced the demise of the Exxon Valdez oil tanker that had hugged the shoreline too closely to avoid Columbia icebergs and then collided with a rocky shoal, which caused the largest oil spill in United States waters to that date (Pfeffer, 2023). Post disaster, stakeholders established a coalition of their own, the Prince William Sound Regional Citizens' Advisory Council, "to promote tanker safety in Prince William Sound to provide a voice for citizens affected by decisions related to the Alyeska Pipeline terminal and associated tankers" (PWSRCAC, 2023).

1980s–2000s—Mount Rainier debris flow project

Complementary risk-mitigation and research goals of land managers and scientists led to a culture of inter-agency coalitions that advanced long-term cooperation.

FIGURE 1
The author stands beside the subfossil stump of a victim tree buried by the Electron Mudflow (lahar) from Mount Rainier. Radiocarbon dating and tree-ring analyses yield a provisional date for the Electron Mudflow of late 1507 CE (Pringle et al., 2022). The lahar inundated the Puyallup Valley as far as 60 km from the volcano. This stump is located at the margin of a newly constructed neighborhood within the city limits of Orting, Washington, and was pulled from the ground to the surface to enable neighborhood enlargement. Public officials recognize threats from future lahars and work continuously with multiple coalitions to prepare community members for potential evacuations (Driedger et al., 2020). Small slices of this stump, originally 9 m in circumference at breast height, are displayed at community outreach events to promote understanding about the nature of lahars (USGS photo September 2002).

At the USGS Water Resources Washington District Office, I initiated a decade-long interagency study of glacier-generated debris flows, which had repeatedly ravaged the unstable, recently deglaciated areas on Mount Rainier (Walder and Driedger, 1993). As a project co-leader, I conducted field investigations, aided outreach promoting public safety, and, at times, served as a news media spokesperson. The project demonstrated a successful model of land-management and science agencies working cooperatively for hazard mitigation and information dissemination. It has been followed by debris-flow forecasting (Beason et al., 2021) and it further blended USGS and NPS staff into a team that would become central to future projects, most notably the Mount Rainier volcano hazards working group described in the following section.

Ongoing—transdisciplinary volcano risk management system

Prolonged and broad involvement in response during the 1980–1986 eruptive periods at Mount St. Helens prompted regional emergency managers to assemble long-term and multijurisdictional volcano hazard working groups for the development of emergency management response plans, community education, and strategies for cooperation and communication during crises at threatening volcanoes in Washington and Oregon.

Volcano hazard working groups support public officials' needs for policymaking, communication, coordination, mitigation, and response planning. The multiagency "Living with a Volcano in your Backyard Outreach Program" supports community education by empowering professional information distributors [news media (Driedger and Scott, 2010), community and school educators (Driedger et al., 2005), and park rangers (Driedger et al., 2002)] to convey volcano safety messages as part of their organization's communication strategy (Pierson et al., 2014; Driedger et al., 2020). All organizations work within the scope of their profession's mission in support of the Volcano Risk Management System (Wright et al., 2023), which follows general tenants of Community Based Disaster Risk Reduction (CBDRR) (Cadig et al., 2016) and acknowledges the differences in professional cultures described by Newhall (2017). Figure 1 shows the author beside a lahar victim tree that yielded slices for display at public outreach events.

Ongoing—binational exchange coalitions

Binational exchanges have boosted transdisciplinary coalitions locally.

Since 2013, USGS volcano scientists have implemented a dozen binational exchanges of emergency planners and responders, educators, and park rangers who work in at-risk communities of the United States and Colombia, and Ecuador and Chile. Organizers designed this transdisciplinary program as a highly motivating learning environment to encourage the understanding of volcanic disasters and effective mitigation options, prompt participants to strengthen emergency planning efforts, and to foster trust-building, socialization, and coalition building among people who must cooperate for volcano risk reduction. Participants visit sites of previous volcano disasters and speak with survivors and other-nation counterparts, and they observe education and emergency response capabilities and facilities (Driedger et al., 2020). Trips have resulted in transdisciplinary deliverables that fulfilled the experiential learning cycle advanced by Kolb et al. (2001) and discouraged isolated and top–down interactions discussed by Fischhoff (1995). This program is supported by the Volcano Disaster Assistance Program (VDAP), a joint U.S. Geological Survey (USGS)—U.S. Agency for International Development (USAID) program.

Discussion and conclusion

Wolff (2001) identified nine dimensions that are critical to coalition success: readiness, intentionality, structure and organizational capacity, taking action, an engaged membership, strong leadership, human and financial resources, relationships, and technical assistance. To these concepts, as noted in the coalition examples, I add science-based transdisciplinary approaches for societally relevant problem-solving. When developing any coalition, begin by identifying a problem and people with common purpose and complementary resources. Include people with vested interest in outcomes and who can provide a voice on behalf of others. Build trust among members. Reach out to non-traditional partners. Boost the relevance of your science by co-development of objectives, plans, and deliverables (Perry et al., 2016). Brand your coalition with a name and membership list. Expect setbacks. Celebrate successes. Recognize that the missing piece of effective science communication might be commitment to coalitions.

Early in my career, I found myself as a woman, akin to a fish swimming in a current of men. Now, I enjoy the company of many women who work in science and positions of authority. Maintaining mutual respect, focus on project objectives, and participating as much as possible in inclusive coalitions have been my mechanisms for coping with gender inequality. Today, the body politic acknowledges that cocooning of career options by gender is counterproductive. Transdisciplinary coalitions that contain women and men, seniors and early-career researchers, and scientists and non-scientists hold advantage because this spectrum is relatable to our nation's population (Valantine and Collins, 2015) to whom we owe our scientific abilities and attention.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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