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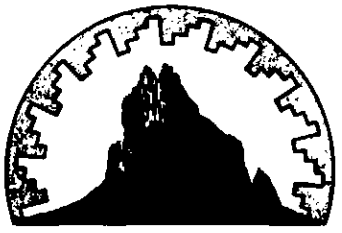

Continental Magmatism — Santa Fe 1989

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During the week of June 25 to July 1, 1989, some 800 volcanologists, petrologists, geochemists, geophysicists and geologists gathered in Santa Fe, New Mexico for the biannual general assembly of the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI). IAVCEI is responsible for the production of the *Bulletin of Volcanology* in addition to co-ordinating a number of international initiatives in volcanology. The last meeting of IAVCEI was held in conjunction with the International Union of Geodesy and Geophysics (IUGG) meeting in Vancouver, BC in 1987, and the next is scheduled for the IUGG meeting in Austria in 1991. The IAVCEI meetings alternate with the quadrennial meetings of the International Volcanology Congress (IVC). The IAVCEI and the Congress meetings are the main international scientific focal points for volcanology and related studies.

The venue of the meeting was particularly appropriate, since the Jemez Mountains, the site of Smith and Bailey's classic work on ash-flow tuffs and caldera development, lie northeast of the city of Santa Fe, which is nestled in the Rio Grande Rift Valley, another focus of Cenozoic volcanic activity. The Taos volcanic field, also related to the Rio Grande rift, lies northwest of the city. The venue is also situated near many classic volcanic areas of the western United States, and 16 pre- and post-meeting field trips provided an opportunity for delegates to see many of these classic areas.

The meeting was organized in a unique manner in order to foster communication and discussion among the participants. Of the some 630 scientific presentations, roughly 480 or 76% were given in half-day poster sessions, with posters on related topics being grouped together. Oral presentations were given in two main ways: as longer overview papers at the start and the end of the meeting, focussing on continental magmatism in western North America, and as shorter presentations, in group discussion sessions. Four half-day discussion sessions ran concurrently with the posters, and featured papers with divergent views. This was intended to foster discussion on important topics in volcanology. These discussion sessions were supplemented with related poster displays. In addition, a number of video presentations were given adjacent to the poster area. Even with this format, there was more material of interest to view or hear than could be attended. Although one was able to sit in on, or view, or discuss much of the material being presented, one could still not take in all the concurrent events. In contrast to many international meetings, there were very few no-shows for either the oral or poster presentations: a refreshing contrast from the situation at the subsequent International Geological Congress in Washington.

Delegates recouped much of their registration fee in publications. All delegates received copies of the Abstract Volume, the 2-volume set of field trip guides for the meeting (published by the New Mexico Bureau of Mines and Mineral Resources as Memoirs 46 and 47), and a National Academy of Science publication from 1984 entitled *Explosive Volcanism*. Copies of the Abstract Volume (New Mexico Bureau of Mines and Mineral Resources Bulletin 131, 340 p.) are available at a cost of $12 US plus $1.50 shipping from the New Mexico Bureau of Mines and Mineral Resources, Socorro, NM, USA 87801.

The meeting was interrupted in mid-week (June 28) by intra-congress field trips. Delegates could view the nearby Valles Caldera, the Taos Plateau, or take a rafting trip down the Rio Grande river to look at maar deposits. Alternatively, they could explore the scenic city of Santa Fe. This was a welcome break from the technical sessions and also served to foster discussion and provide an opportunity to see some of the rocks that were being discussed at the meeting.

In addition to the technical sessions, there was ample opportunity to view a variety of films on volcanoes, recently obtained eruption footage, and educational videos. Some of the more recent of these have been, or will be, reviewed in GEOLOG. Yet others were not commercially available for a variety of reasons, yet were of great historic and/or scientific interest. Certainly the widespread availability of VCRs and hand-held video cameras has been a boon as a means of documenting volcanic eruptions, processes, and textures, and in communicating these results to other scientists, students, and the public.

The meeting was well-attended by Canadian scientists, with some 40 Canadians being present. The largest contingent was from Falconbridge Exploration Inc., but representatives from the Geological Survey of Canada, the Ontario Geological Survey, the Royal Ontario Museum, and many universities were also in attendance. Part of the large Canadian turnout was related to a day-long session on June 29 on Mafic Magmatism Associated with Proterozoic Rifting as part of IGCP Project 257 (Mafic Dyke Swarms).

In keeping with the venue in the western United States, the focus of the meeting was on continental magmatism, although presentations on all areas of volcanology were given at the convention. It is impossible, as usual, to adequately cover all the topics discussed in a short conference report. Hence, I will focus instead on a number of evolving areas of volcanology where new results are being uncovered or new ideas being developed which are likely to be of general interest to Canadian geoscientists.

The discussion session and related posters in the symposium on "High-Temperature Pyroclastic Eruptions and Lavas" examined, in part, the question of how to distinguish widespread silicic lavas from ash-flow

sheets. In the past, large volumes of thick, relatively massive silicic volcanics have generally been assumed to be emplaced as enormous pyroclastic flows. However, in areas such as southwestern Idaho and the Davis Mountains in Texas, widespread silicic lava flows (30-50 km in length) have recently been described, which are not associated with calderas (Wolff, U of Texas, Arlington). From the poster displays, it is clear that the silicic lavas generally have textures distinct from those of ash-flows, and experienced workers should have no trouble distinguishing between the two, particularly if there are good controls on the regional geology. Workers in ancient terranes, particularly those without experience in these types of rocks, should take note that not all extensive, thick, massive silicic rocks are ash-flows.

Geochemical studies of many Cenozoic volcanic fields in the western US are showing that they are more complex than previously thought. In an overview paper on post-Laramide volcanism in the western US, Bob Christiansen (USGS, Denver) described 3 tectonomagmatic associations, namely:
(1) predominant calc-alkalic basalt to andesite to subordinate dacite to rhyolite, erupted along continental-margin arcs parallel to active subduction zones (true arc suites);
(2) volcanic suites with little or no basalt but abundant andesite to rhyolite, broadly calc-alkalic but more potassic than the arc suites, erupted in belts across interior regions of active extension (*e.g.*, Absaroka and Yellowstone volcanic fields) (neither oceanic or continental arcs); and
(3) basaltic, alkalic, and bimodal rhyolite-basalt suites in rifted regions in cratonic forelands adjacent to the interior andesite-rhyolite belts.
The significance of suite 2 has not been fully recognized in the past, but this suite shows that there are calc-alkalic rocks and calc-alkalic rocks. In addition, work by Colucci and others (SMU, Texas) in the San Juan volcanic field shows that the pre-caldera collapse andesite stratovolcanoes contain both alkalic and calc-alkalic lavas and tuffs, which were erupted simultaneously and adjacent to each other. Thus, using geochemistry to characterize the tectonic setting of ancient volcanic suites is becoming a more complex process. Numerous other papers emphasized this theme. Probably the most important lesson for those of us working in the Precambrian is that different magma suites may be erupted closely together in time and space, and that a change from calc-alkalic to alkalic lavas in a volcanic succession does not necessarily mean a significant change in tectonic setting.

Considerable attention is still being paid to the "Dynamics of Volcanic Eruptions", and sessions featured displays of new field data from active volcanoes, detailing eruptive processes and the nature of underlying magma chambers, as well as various modelling studies of volcanic processes. The study of magma-water interaction is still of great interest, and is one of the few areas where the study of older volcanic sequences, both Paleozoic and Precambrian, can provide considerable insight into the types of deposits formed as a result of these interactions.

Since the eruption of Mt. St. Helens, El Chicón, and Nevado del Ruiz earlier this decade, the study of volcanic hazards has been given a new impetus, and this subject was a major topic of the meeting. It is also one of the more interdisciplinary areas of volcanological research, as it brings together geologists, petrologists, gas geochemists, seismologists, and other geophysicists in the study of active volcanic systems. Several papers dealt with such interdisciplinary studies. Remote sensing is increasingly being used to monitor volcanic eruptions, particularly in remote areas. A post-meeting workshop, held in conjunction with the International Geological Congress, dealt with the topic of "Volcanic Hazards", including the monitoring of active volcanoes, prediction of eruptions, and government and public response to notification of these hazards. A particular problem recognized in the last few years is that unrest, characterized by uplift and seismic activity, may be a common occurrence at large silicic calderas, thus making it difficult to discern between pre-eruptive activity and normal unrest. Kaizuka, Newhall, Oyagi, and Yagi (Japan and USGS) have noted extremely rapid uplifts (average 15-20 cm·yr^{-1} for the last 500 years) at Iwo Jima and suggest that it might be an ideal laboratory for studying the precursor activity to a large caldera eruption, and for learning how to distinguish normal episodes of unrest from those which might be precursors to eruption.

Another area of volcanology that has seen explosive growth in the last few years, primarily as a consequence of studies of Mt. St. Helens, is the study of volcaniclastic rocks and the "Interpretation of Volcanism from Sedimentary Sequences". As pointed out by Cas (Monash U, Australia), it is critical to distinguish between the ambient sedimentation, which provides constraints on the original depositional environment, and the sediments related to volcanism, which provide information on the geologic history of neighbouring volcanic source regions. A continuing problem in the study of volcaniclastic sequences is that we still know little about the nature of submarine pyroclastic eruptive process and products. Can we distinguish between a pyroclastic flow erupted under water and a turbidite composed wholly of volcanic detritus? And, is it significant in terms of the geological interpretation if we cannot? There are two divergent views on this subject at present. Some view all of these rocks as epiclastic; others regard them as a mixture of pyroclastic and epiclastic rocks. The latter view was well illustrated by Fiske and Cashman (Smithsonian Institution and Princeton) who described a submarine fallout deposit deposited on top of a debris flow that was deposited hot (Tamura, Koyama, and Fiske, Japan, Smithsonian). In addition to their poster, they had a live action display illustrating the fallout rate of rock *versus* pumiceous material in water. There was little noticeable difference in the fallout velocity of the rock fragments *versus* water-soaked pumice. Again, the whole topic of volcaniclastic rocks and the nature of sumarine pyroclastic deposits is of direct relevance to many geologists working in the Precambrian, and one where Canadian geologists can make a significant contribution.

In many volcanic fields, the abundance of volcaniclastic rocks is not fully appreciated, and they have not been well studied. This point was driven home to me on a post-meeting field trip to the San Juan Volcanic Field led by Peter Lipman, Ken Hon, David Sawyer (USGS), Mike Colucci, Steve Balsley, and Mark Ferguson (SMU, Texas). The pre-caldera stratovolcanoes contain voluminous volcaniclastic deposits (30-50% of the pile), none of which has been studied in great detail. Similarly, most of the moat-fill sediments have not been studied. Although these rocks are noted in the literature, their abundance is not fully appreciated until viewed in the field. This is certainly an area where work is needed; work which would be extremely relevant to studies of Precambrian volcanic terranes.

It was reassuring to see that basic geologic mapping still has a key role to play in volcanic studies. New maps were on display of the island of Hawaii (Wolfe, USGS, Vancouver), Mount Adams (Hildreth and Fierstein, USGS, Menlo Park), the Medicine Lake Volcano (Donnelly-Nolan, USGS, Menlo Park), and the Lassen area (Muffler and Clynne, USGS, Menlo Park), among others. In many of these cases, pre-existing maps were lacking, or were several decades old. The poster format at the meeting was well-suited for the display and discussion of these maps; a trend that should be continued.

An interesting question raised by George Walker (U of Hawaii), and which cannot be answered at present, is the relationship of large silicic magma chambers to major fault zones. Do these calderas have elongate magma chambers because the fault zones are places where magma can accumulate and spread easily (passive), or are the magma chambers elongated as the result of active shear movement along these zones, as well as local generation of magma (active)? Thus, are shear-zones that we find in older volcanic terranes there because they initially controlled volcanism, or did they develop later along local weaknesses?

One important point that came out of many of the overview papers and the sessions on

Cenozoic magmatism in western North America is that a good understanding of the tectonic/geologic history of the area is needed to sort out the volcanic environments present, and their inter-relationships. Without fossil and paleomagnetic evidence to recognize accreted terranes, reliable geochronology, and the ability to reconstruct plate motions in the Pacific, we would be a long way from truly understanding the development of western North America. This is a sobering thought for any of us who work in older terranes.

For the most part, the unique format of the meeting was quite successful. It was certainly easier to learn more, and to interact with other volcanologists with this set-up, than if 76% of the papers had been presented orally. A short wrap-up at the end of each day, highlighting the outcome of some of the discussion sessions, would have been an added touch for those actively involved in one of the four concurrent sessions, but life is never ideal.

Volcanology is clearly an active and dynamic field in the late eighties. The Santa Fe meeting follows two earlier, very successful volcanology meetings (IVC in New Zealand in 1986 and "How Volcanoes Work" in Hawaii in 1987 (see *Geoscience Canada*, v. 14, p. 232-234)). The next major international meeting is the International Volcanology Congress meeting in Mainz, Germany next fall, and it will have quite a task to top Santa Fe 1989.

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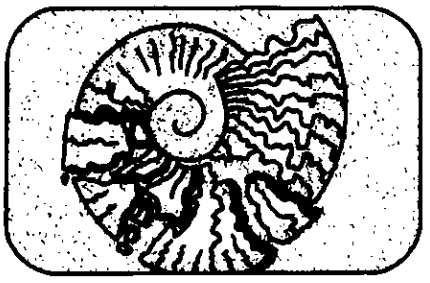

Society for the Preservation of Natural History Collections

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What happens to specimens after they have been collected? Once a study has been completed and a paper has been published, how many of us give much attention to the long-term survival of reference material we worked so hard and spent so much to acquire?

The Society for the Preservation of Natural History Collections (SPNHC) does address this issue and, as demonstrated by presentations at this year's annual meeting, seriously considers how we collect, what we collect, and how we can ensure specimen longevity. The fourth annual meeting of SPNHC was sponsored jointly by the Tyrrell Museum of Palaeontology in Drumheller and the Department of Biological Sciences, University of Calgary, from 22 to 29 July 1989. The meeting was the first co-operative venture between the University of Calgary and the Tyrrell Museum since the two institutions signed a joint agreement in 1984 to establish a working relationship.

SPNHC is a multidisciplinary organization composed primarily of managers, conservators and curators of museum collections from across North America and abroad. The society's goals are to improve knowledge of the practical problems of maintaining collections. As well, philosophical and ethical aspects of collecting are discussed. The society publishes a reviewed journal — *Collection Forum* — that provides invaluable information on collections care. A growing "awareness" of the need for conservation and cost-effective care of natural science specimens is apparent from the increasing level of activity of SPNHC. Membership in the society has tripled in the past three years, and now stands at over 350. Many of North America's major museums are represented and institutions are lining up to host future conferences (1990, Field Museum, Chicago; 1991, National Museum of Natural Sciences; 1992, University of Nebraska Museum).

To discuss this year's theme — "Collections — Our Treasured Heritage", conference organizers staged eight sessions over a five-day period. Even though some of the sessions dealt with biological collections, many of the topics should be of direct interest to geologists. Dr. Emlyn Koster, Director of the Tyrrell Museum of Palaeontology, and Gerald Fitzgerald, Collection Manager and Conservator of the Paleobiology Division of the National Museum of Natural Sciences (NMNS), chaired the opening session on Geology. George Robinson from the Mineral Sciences Division of the NMNS delivered the keynote address — "Geological Collections: The Broad Spectrum", stressing the need for accurate documentation to ensure the value of reference specimens. Minerals from the Pinch Collection were used to illustrate the lecture. Presentations on ocean sediment collections, meteorite preservation, a case study of dinosaur trackway conservation, radon hazards in earth science collections, consolidation of subfossil walrus bone and techniques for measurement of specimen oxidation followed.

Session 2, dealing with conservation concerns, began with an address by keynote speaker Mary-Lou Florian from the Royal British Columbia Museum. Her perspective on developments in conservation of natural history collections was followed by case studies of a wide range of specimen storage problems.

The final session at the Tyrrell Museum was a panel discussion on the topic of "Public *versus* Research Access to Natural History Collections". The ensuing discussion demonstrated that a wide range of opinions exists as to why specimens are collected, how much is enough, if we should collect more if we cannot properly store what we have, and if the public should have access to collections and in what fashion.

Session 5 at the University of Calgary leg of the conference began with presentations on biological topics. Session 6 contained two presentations on geological topics. The first, by Anna Curtis of the Tyrrell Museum of Palaeontology, outlined implementation of Alberta government legislation to protect the province's paleontological resources. The importance of a group like SPNHC that examines collections care was dramatically summed up during the presentation by Philip Doughty, Keeper of Geology at the Ulster Museum, Belfast, who presented a somewhat frightening picture of the state of some geological collections in the UK. As part of the Geological Curators Group, he helped examine many important collections from smaller museums in Great Britain. Photographs of heaps of scientifically important paleontological collections in musty basements, lit by a single dangling bare light bulb, were not uncommon. Fortunately, the Geological Curators Group has taken vigorous steps to improve the situation. The point was made that scientific societies should be