ASH FALL

Newsletter of the Volcanology and Igneous Petrology Division
Geological Association of Canada

#36 **November, 1994**

EDITOR UP FRONT

This seems like an excellent time to send another ***Ash Fall***, having given you time to recover from the previous one, fieldwork and all. This issue will be a solo effort; I've been left with the non-trivial task of filling in for Cathie. "Where ***is*** Cathie?", you might ask. In South America, as it happens. The GSC recently embarked on a project to assist the geological and mining surveys of Chile, Argentina, Bolivia and Peru - a project designed to spur economic development near the borders of these countries. Cathie's heading up the project. More from the boss when she returns. In the meantime, you're stuck with me.

Those of you who were at the GAC/MAC conference know that it was great; those who couldn't make it don't want to be reminded, so I'll only hit the high points. The minutes of the AGM are elsewhere in this newsletter. Highlights are the awards, **Bill Mathews** receiving the **Career Achievement Award** and **Shelley Higman** the **Leopold Gelinas Silver Medal**. The special session was well attended and the pizza at lunch disappeared quite quickly. The only addendum to the minutes is that I have had a cheque, to the value of $589 from the sale of Trans-Mexican field trip guide book, production of which was sponsored by the Division.

The present executive are back for another tour, with the exception of Georgia Pe-Piper. Many thanks to Georgia for her service to the Division. The executive welcomes John Stix of the Université de Montréal, who was elected to replace Georgia in the position of Councillor East. While on the subject, my thanks go to all who took the trouble to fill out those annoying ballot forms. You might have thought it a formality this time round, but there may come a time when it isn't. Thanks are due also to our teller, Wulf Mueller. And several margaritas, as I recall.....

I was particularly glad to meet more of our members and get feedback on anything we happen to be doing right. One comment of note which I got - from more than one person - was that they felt they didn't have anything useful to contribute. I beg to disagree; ***anything*** pertinent to volcanology in or around Canada is grist to our mill. For example, several members cleaned up on the free posters entitled "le Volcanisme au Québec", which Jerry Rémick so kindly told us about. If you haven't read it in ***Ash Fall***, I probably haven't heard about it - which covers a lot of ground. Reuter's we ain't, but we try.

One last appeal - nominations are now open for the 1995 **Career Achievement Award** and **Leopold Gelinas Silver Medals**. Regulations later on in the newsletter. Get 'em in now!

Dr. W. H. Mathews, 1994 Career Achievement Medal Winner

Citation read at medal presentation: May 17, 1994 Waterloo, Ontario.

Dr. W. H. Mathews is truly one of Canada's outstanding geologists. His knowledge, scientific insight and wisdom have had, and continues to have, an impact on a wide range of subjects in geology, not the least of which is Tertiary and Quaternary volcanism in Canada.

Bill's career started officially started in 1940 when he graduated from the University of British Columbia with a degree in Geological Engineering. An M.A.Sc. followed the next year. He then spent the early forties mapping in sundry parts of British Columbia with the British Columbia Dept. of Mines (as it was then called). Most important of the areas he mapped for volcanology was the Tuya-Teslin country. It was here that he was to make his first of several significant contributions to volcanology. Confronted with strange volcanic formations we now know as tuyas, Bill sought to understand them. He was the first to fully appreciate and publish on their subglacial origins.

Going on to graduate school in Berkley, Bill worked with the famous geologist Howell Williams. His thesis was to include a study of the Garibaldi Volcanics in southwestern British Columbia. Granted his Ph.D. in 1948, Bill's work on Garibaldi led to five journal articles between June 1950 and August 1952; the first ever international journal papers describing the young volcanic features of the Mount Garibaldi area and indeed young volcanic features in Canada. Nineteen fifty seven saw the publishing of two further papers on Garibaldi, including a map that work by later researchers has done little to improve.

Garibaldi became the first Canadian volcano to make it onto any international compilations. Bill, so to speak, put Canadian volcanology on the map. And he did so in a unique way. For Garibaldi was not your run-of-the-mill volcano. The complex interaction of glaciers and volcanic rock was recognized and interpreted by Bill and these ideas have been used by physical volcanologists the world over. Bill also devised a simple, inexpensive way of determining the chemical composition of volcanic rocks by using the refractive index of fused glass samples. This method was widely used in the 1950's before access to XRF's and other advanced analytical equipment became routine.

Bill has many former students that are far flung around North America, each following one or more of Bill's loves, whether it is volcanology, glaciology, glacial hydrology, coal geology, or Quaternary history. All of these subjects he and his students have studied in detail and are published in his over 135 career publications. He served as Chairman of the Dept. of geology at UBC from 1964-1971 and has put his time in on numerous committees including several stints on the National Advisory Council on Geological Science. Bill is truly a deserving recipient of the Division's Career Achievement Medal. Would he please come forward to receive his medal.

Cathie Hickson

The discovery of the 'Tuya'

by W. H. Mathews

The information that I was to be awarded the career achievement medal by the Volcanology and Igneous Petrology Division of the GAC came as a complete surprise. Though my PhD thesis, submitted almost a half century ago, on the Geology of the Mount Garibaldi area, 50 km north of Vancouver, emphasized both volcanology and igneous petrology my activities since the mid 50s have been essentially curiosity-driven projects in glaciology, geomorphology, and stratigraphy, with side trips into ground water and coal. I have considered myself accordingly to be a 'miscellaneous' geologist. But my surprise on learning of the award was mixed with pleasure on the recognition of a job done, and hopefully well done. I appreciate this sign of recognition and achievement. Thank you very much.

I have been asked to say a few words in response to this presentation and have chosen a quick review of the discovery of the proglacial or intraglacial volcanic deposit/land form, the "tuya". Going with it is, I hope, some of the pleasure that its discovery brought to me.

The story starts in an administrative office of the B.C. Department of Mines in the winter of 1942-43. The task: to find a suitable field area for two enthusiastic junior geologists - Ken Watson and myself. The decisions turned soon to areas immediately adjacent to the newly completed Alaska 'Highway'. But the GSC had already planned field work along this road. Happily someone had mapped from tri-camera photos an area that aircraft might follow in a short cut from Fort St. John to Whitehorse or points west. This mapping involved a single flight-line of vertical photos to which was appended information from oblique photos to port and starboard. The result was a map reproduced on a scale of 4 miles to the inch with drainage, outline of lakes, and form lines at 1000 foot intervals along a strip about 20 miles wide from the upper reaches of Tuya River northwest for 60 miles to the head of Teslin Lake. It was surrounded by blank white unmapped area.

We started our field work in late June at Dease Lake supplied with black and white film in folding cameras, standard 1930s AATV (i.e. almost all terrain vehicles, better known as horses) for cook, packer, equipment and supplies (geologists and assistants walked), and standard 1930s accommodation (tents). By mid August we had covered the area that had been mapped topographically and were low on supplies. Ken Watson and the Indian cook and packer went to Dease Lake for more supplies while I and the two assistants handled both the geological and topographic mapping with the aid of a sextant for horizontal angles, large protractor, altimeter, and Brunton compass.

The Tuya-Teslin area exposed not only Paleozoic limestones, lower Mesozoic metasediments and metavolcanics, granitic plutons plus a dozen or so obviously young basaltic bodies. In addition there was a good record of glaciation, erratics almost to the top of the highest summit, plus till, meltwater channels, and shorelines of former ice-dammed lakes.

The young basalts caught our attention, particularly the bedding in yellowish-brown breccia ('agglomerate' in Watson, K.D. and Mathews, W.H., 1944) tilted about 25°, flat-lying basalt flows with vertical joint columns, pillow lavas, one roughly conical mountain of which the upper part was hyaloclastite (our 'ash'), and numerous nearly horizontal land surfaces perched high above the base of the basalts.

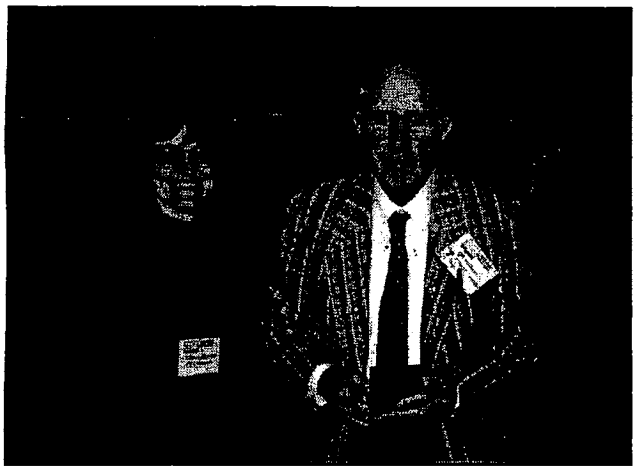
One slide shows what I regard as a major contribution to geology, not this pile of radially jointed pillows, but rather my field assistant. The Department of Mines, originally proposing to send me to a particularly rugged part of the Purcell Range, had invited me to select my own 'mountain goat' to share a climbing rope for field work in the summer of 1943. I invited a young mountain climber who was just graduating from high school with an outstanding scholastic record. He accepted. And so began the geological career of John Fyles who was later to rise through the ranks of the Geological Survey of Canada to the position of Chief Geologist. Though in 1943 he had had no exposure to formal geology he was able to grasp the essentials and ask very penetrating questions about the rocks we were examining.

In mid September we walked with the packtrain the 80 miles south from Tuya Lake to Telegraph Creek where three of us met the first human beings outside our party of 6 that we had seen in 100 days. We reached Victoria in early October bringing back notes and vivid memories of the young volcanic rocks but no clear explanation of their anomalous form and internal structure.

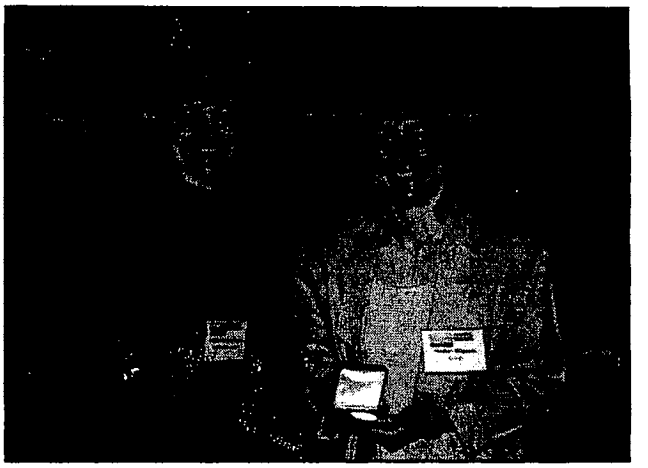
It was not until the winter of 1946-47 during my PhD work at Berkeley that the answer came. In a graduate seminar Howell Williams assigned us a paper by Richard Fuller (1931) *on aqueous* chilling of basaltic lava on the Columbia River Plateau. Here pillow lava, pillow breccia, and tuff breccia with inclined bedding were assigned to a subaqueous environment, and nearly horizontal lava flows to a subaerial environment. The lower underwater slopes corresponded to the foreset beds of a Gilbert type delta, the flatter top beds and their upper surfaces to the topset beds. In the Tuya-

Teslin area the water depths ponded by ice could be much more than the water depth on the Columbia Plateau ponded by basaltic flows. The structure and land form is particularly well illustrated by a flat-topped volcano west of Tuya Lake which we had already named 'Tuya Butte"(Watson, K.D. and Mathews, W.H., 1944). Thus arose the name 'tuya' for those volcanoes displaying both the subaqueous and subaerial forms and deposits. Though the name Tuya was applied to the river at least as early as 1875, its translation is not known to the local Indians.

Tuyas and other proglacial volcanic features can be expected in any locality at high latitude or altitude capable of supporting glaciers, and accompanied by volcanism. Iceland is one such example. There the two-tiered volcanoes are referred to as 'table mountains'. A 1941 diary entry by a farmer and amateur geologist, J. Lindal, shows thinking consistent with the views expressed here (Sigurdur Thorarinsson, pers. comm.), but it was not for a decade or more that it became widely adopted in Iceland.



Bill Mathews, Career Achievement Medallist



Shelley Higman, Leopold Gelinas Medallist

Ms. Shelley Higman, 1994 Leopold Gelinas Silver Medal Winner

Citation read at medal presentation: May 17, 1994 Waterloo, Ontario

This award, for which a silver medal was struck with funds from Jerry Rémick in memory of Leopold Gelinas, is meant to honour an outstanding Masters thesis which makes a significant contribution to volcanology and/or igneous petrology. Shelley's thesis entitled:

An application of nonlinear dynamics to the theory of oscillatory zoned magmatic plagioclase,

was completed at Queen's University under the supervision of Prof. Tom Pearce.

During the last three years I have sent theses nominated for both the Gold (Ph.D.) and Silver (M.Sc.) Leopold Gelinas Medals to outside reviewers for comment. Shelley's thesis was sent Dr. Bjorn Jamveit, Professor of Petrology, University of Olso. I will read you a couple of excerpts from his letter.

"I have read Shelley's thesis with great interest. It is probably the best thesis at an M.Sc. level that I have ever read.....The thesis reaches an exceptionally high scientific standard both in terms of content (technical merit and originality) and presentation....this thesis is the product of an exceptionally mature and original student with a thorough state of the art understanding of her topic."

And with that, I would like to present her with this medal on behalf of the Volcanology and Igneous Petrology Division.

Cathie Hickson

ANNUAL MEETING OF THE VOLCANOLOGY DIVISION; GAC
May 17th, 1994
Minutes

Attending: C.J. Hickson, Chairman; S. Peloquin, Student Councillor; J. Stix, Councillor East Elect; A. Bailes; W.R.A. Baragar; M. Bliss; E.H. Chown; P. Clifford; B. Edwards; R. Ernst; D. Francis; S. Hauksdottir; M. Higgins; S.L. Higman; S. Kieffer; M. Lambert; W.H. Mathews; W. Mueller; J. Nicholls; W.A. Padgham; H.C. Palmer; T.H. Pearce; J.K. Russell; T. Skulski; M. Stout; P. Metcalfe, Secretary-Treasurer.

1. The **meeting was called to order** by C. Hickson at 12:15 pm, Tuesday May 17th, 1994 in room DO-1302; University of Waterloo, Ontario.

2. **Agenda** for the meeting was presented by the Chairman and approved as presented (Moved J. Nicholls, 2nd W.A. Padgham)

3. **Minutes of the previous annual meeting** were distributed and approved after a spelling error in a name was noted. (Moved J. Nicholls, 2nd W. Mueller).

4. **Business arising from the minutes**
The Chairman reported that Mme Gelinas had received the three copies of the Leopold Gelinas Award which she had previously requested for her children.

5. **Report of the chairman** was summarized by the Chairman, who noted that a copy would be published in the next ***Ash Fall.***

6. **Report of the Secretary-Treasurer** was presented and accepted (Moved J. Nicholls, 2nd R. Ernst). The division has 101 members as of April 8th, down from a membership of approximately 120 on December 31st 1993. The Secretary-Treasurer noted that the apparent decline is probably due to late payment of membership fees, also noting the addition of some 10-15 new members. Division funds are $3156.90 in the black, of which $500-600 should be reserved for ***Ash Fall*** production costs. The Secretary-Treasurer noted that the apparent increase from last year was a result of the earlier arrival of this year's membership fees and reported a net gain of $100-200 over the year.

The Chairman noted that the supply of Leopold Gelinas medals was running short. J. Nicholls asked if Division fees should be raised by $2, to cover the cost. The Secretary-Treasurer submitted that this was not necessary at the present time.

7. The **Leopold Gelinas Award** for the best M.Sc. thesis was awarded to **Shelley L. Higman** for her thesis entitled *An application of nonlinear dynamics to the theory of oscillatory zoned magmatic plagioclase,*, completed at the Queens University. The Chairman read the citation and Ms Higman accepted the award amid applause.

8. The **Career Achievement Award** was made to **William H. Mathews**, the Chairman reading the citation. Bill then presented a short account of his work in the Tuya-Teslin area of British Columbia and received the award amid prolonged and enthusiastic applause.

9. **Scheduled activities.**
Victoria '95. The Chairman noted the activities taking place, these being a special session entitled "Volcanic activity in extensional zones", a pre-meeting field trip to the volcanoes of Wells Gray Park

and of the Garibaldi and Pemberton volcanic belts and, lastly, a post-meeting field trip to Mount St. Helens.

Winnipeg '96. R. Ernst inquired about the possibility of a special session on dating and palæomagnetism of dyke swarms; W. Mueller enquired as to the possibility of a session to study shallow subaqueous volcanism in the Flin Flon area; J.K. Russell suggested that topics be broad in scope. R. Ernst suggested a field trip to the Keewanawan volcanics and R. Baragar suggested a field trip to the Logan Sill. A. Bailes noted that he was the field trip organizer for Winnipeg '96 and suggested that interested persons should discuss field trips with him in greater detail, following adjournment.

10. **New business**

Election of officers for 1994. The Chairman announced that Wulf Mueller had been appointed by the executive to serve as teller for the election. Wulf reported that, on the basis of the 17 ballots returned, the election slate had been approved unanimously. The elected members of the executive are:

Chairman	C.J. Hickson (re-election)
Vice-Chairman	T.H. Pearce (re-election)
Secretary-Treasurer	P. Metcalfe (re-election)
Councillor on Research	J.K. Russell (re-election)
Councillor-East	J. Stix
Past-Chairman	L. Coleman (re-election)

11. **Any other business**

The chairman noted that several members had availed themselves of the free posters advertised in ***Ash Fall.***

J.K. Russell congratulated the Chairman on running a "tight ship" with respect to the AGM.

12. R. Ernst moved that the **meeting be adjourned**; 2nd by W. Mueller. Carried unanimously.

Paul Metcalfe

EDITOR'S (?)CORNER; SQUARE; CELL; CAGE.....

There's been so much happening over the course of the summer that this Ash Fall is going to be a tad long. I've kept my usual corner here, as well as pre-empting Cathie's space up front, just to give you some odds and ends.

Firstly, I've taken the liberty of including, with this edition, a member's directory (n four point microfiche, to save on copying). I'd like some feedback from you all here - should we include telephone numbers? Fax numbers? Does anyone need all or part of this information on disc? Does anyone wish to remain ~~anomalous~~ anonymous? The idea came from Vancouver's and Smithers' mineral exploration groups, who each publish directories, updated annually. In our case, the cost can easily be absorbed by membership fees (no increase, by the way).

I'm presently in grave danger of becoming "roadkill on the information superhighway"; I recently stuck my name down for volcano listserv. This is a bulletin board run by Arizona State University, allowing volcano nuts to contact one another. To get on the list, if you have Internet, contact:

Jon.Fink@asu.edu

and ask to be added to the list.

The wide reach of this particular listserv is demonstrated by ***all*** the following advertisements

and accounts. The volume of information which comes hurtling out of this particular pipe is immense, but it needs sifting. The Rabaul eruption alone produced more waste paper than tephra. You have been warned!

One other comment of note; there is an article of possible interest to industry and academia alike, in a less well known journal. The reference is:

Derkey, R.E. 1994. Hot springs and ore deposition on the sea floor off the Washington coast. Washington geology v.22, p.24-28.

Paul

VOLCANIC ACTIVITY

Three areas at least are of interest from the point of view of volcanic activity. The first was the eruption of Llaima in Chile, in May. The second was the much-publicized eruption of Rabaul in September and early October. Presently, Baitoushan volcano in east Asia is stirring, to what effect we are not yet sure, as I write. I've tried to incorporate as many accounts of people who were actually there, resorting to my own illiterate scrawl only when there are gaps.

On the home front (Kamchatka-Alaska-Stikinia-Cascadia), not much is happening at present. Kanaga (51°55'N, 177°10'E) and Klyuchevskoi (56°03'N, 160°39'E) volcanoes had minor eruptions over the summer and early fall. We keep in touch with events there by courtesy of our colleagues at the Alaska Volcano Observatory and Kamchatkan Volcanic Eruptions Response Team.

Paul Metcalfe

LLAIMA, SOUTHERN CHILE
(38.70°S, 71.70°W)

A Strombolian eruption (VEI, 2) started at 0600 on 17th May from this glacier-capped stratovolcano, one of the most historically active in Chile. . A column composed of ash, gases, and steam formed 4,000 m above the summit which itself has an elevation of 3,125 m. A plume was carried toward the ESE, and was seen for at least 40 km, reaching Lake Icalma, Chile and Alumine, Argentina. The volcano has two historically active craters; this eruption issued from the principal crater at the summit. A fissure formed in this crater, 500 m long, trending SW and was the source of a lava flow. The flow drained along the bottom of a glacier located on the Llaima's W flank.

Rapid melting of the snow and glaciers on the volcano has sent tree-laden lahars down the Rios Calbuco and Quepe. The progress of lahars, in terms of approximate straight-line distance travelled from the summit are as follows: a) at 1300, 17 km, b) at 1500, 32 km. At further distances flooding was noted. Because of lahars and flooding, 7 people were evacuated by helicopter.

This eruption is the 46th since 1640. In the past Llaima has had major explosive activity including silicic andesites and dacites between 13,200 and 7,200 ybp. Historic basaltic eruptions have been more benign, although some have been large. The largest were in 1927 and 1957. The current eruption was been preceded by several years of unrest, sending a steam column to 1 km in September of 1992, and provoking two other brief episodes of steam or heightened seismic activity, the latest in December of 1993. Hugo Moreno (Universidad de Chile) estimates the activity to be about VEI=2 so far. Seismologist Gustavo Fuentealba (Universidad de la Frontera-UFRO) is setting out some portable seismographs that will soon be joined by additional instruments from the national civil defense agency (ONEMI).

Adapted from the Global Volcanism Network's preliminary translation of report from Hugo Moreno Roa, with addenda from Norman Banks, U.S.G.S.

RABAUL, PNG
(4.27°S, 152.20°E)

Sifting through all that came flying out of Internet, plus a fortuitous blunder into a very good slideshow at the Seattle G.S.A. meeting has given me a very rough picture of the eruption at Rabaul. Initial reports (non-geological) in the international media were a trifle confused, it seems.

Rabaul is located at the NE tip of the island of New Britain in Papua New Guinea, part of the East New Britain Arc. It comprises a large caldera that is open to the sea, and several post-caldera cones, of which Tavurvur and Vulcan are two. Its last eruption in 1937 led to the deaths of 500 people. During 1994, seismic activity and uplift had been increasing steadily.

The following is taken from a telephone conversation, on 26th September, between the USGS Cascade Volcano Observatory and Chris McKee and Rod Stewart of the Rabaul Volcano Observatory (RVO):

Precursors:

At 0300 local on Sunday, 18 September, a magnitude 5.1 earthquake occurred beneath the harbour. An aftershock sequence from this event merged into an intensifying swarm of high-frequency (A-type) earthquakes. Peak intensity of this swarm occurred around midnight Sunday with about 2 felt events per minute. The earthquake swarm tapered off slightly toward morning. By 0600 Monday the eruption had begun. Thus only 27 hours of unusual seismicity preceded the eruption. Inspection of the seismograms since the onset of the eruption revealed that several L-P events had occurred in the 12 hours prior to the magnitude 5.1 earthquake.

On Monday, September 19th, the following information was received from the Department of Humanitarian Affairs in Geneva:

".....Two volcanic cones on opposite shores of the six-kilometre- wide sea-filled crater of Rabaul Volcano in eastern New Britain began to erupt on the morning of 19th September (local time). Strong explosions have spread fumes and ash over surrounding areas including the waterfront provincial capital of Rabaul at the head of the bay.....State of emergency has been declared in area of Rabaul....."

Little detailed/accurate information came during the initial stages; communication channels were, very properly, reserved for the evacuation. One (second- or third-hand) report indicated that the eruption of Tavurvur began at 0600 (UTC+10) on the morning of September 19th and that, at 0730 there was "a massive explosion from Vulcan", on the western side of the harbour. Rumours of destruction of the city / five cones erupting/destroying themselves / sinking of islands, I'll just leave out. What I got from the slideshow at the G.S.A. was the interesting feature of tephra colour; tephra from Vulcan being light in colour and that from Tavurvur characteristically dark. It was also apparent that the eruption of Tavurvur outlasted that of Vulcan.

The first comprehensive report issued was for 1500, 22nd September - 0900, 23rd September (local time):

"Volcano and seismic activity remained relatively stable overnight.

Tavurvur: *Steady emissions continued with dark grey ash vapour cloud. A low rumbling accompanied the stronger emissions. The ash column is approximately 2 km high. The ash plume is being driven NE over Rabaul town. At night, incandescent ejecta could be seen depositing on the NW flank. Incandescence was rarely visible in the emission column due to the high ash content.*

Vulcan: *Intermittent pulses of stronger activity produced jets of vapour-rich ash cloud at intervals of 5-15 minutes. Collapse of the column produced pyroclastic surges which travel up to 2-5 km from the vent, mostly to the NE. Generally there is a low ash content in the eruption cloud. The column height is about 1.5 km. At night incandescent ejecta can be seen depositing around the vent near the beginning of each pulse.*

Aerial Inspection, 1620-1640, Thursday, 22nd September
Tavurvur: *There is little morphological change. The vent is on the W side of the 1937 crater.*
Vulcan: *The only active vent is near sea level on the breached crater on the NE flank. Eruptions are Surtseyan, highly explosive, low ash, vapour-rich. Apparently there is no great deformation since the start of the eruption.*
Overview: *Overall, volcano-seismic activity has been showing a steady small decline over the last two days. If current trend continues, the eruption should persist for at least several more days. Visibility over Rabaul is very good, but with occasional ash falls."*

(From a report by Ian Ripper, Head Seismologist in Port Moresby)

The Disaster Information Administrator (Geneva), on 22nd September, advised that:
"Volcanic eruptions reaching their peak on Monday morning (local time) are declining. Eruptive columns reached height of 500 to 2,000 metres. Ash fall in Rabaul varying from 30 to 70 cm has been turned into mud by heavy rainfall."

The situation as of 26th September was:
"Vulcan is no longer erupting. No portion of Vulcan has collapsed. Tavurvur is still erupting an ash plume. There is an ashy haze over Rabaul town. Seismicity is much decreased, and is now at about the limit of RSAM detection.

RVO no longer has the ability to locate earthquakes. Three seismic stations remain in operation. The other stations have been incapacitated by tsunamis, vandalism, or heavy ashfall.

About 40 mm of fine powdery ash has fallen at RVO. The airport received about 0.5 m of ash, and the airfall thickens rapidly towards Matupit Island."

Chris McKee and Rod Stewart, R.V.O.

Stan Williams of Arizona State University arrived at Rabaul September 26th along with graduate student Steve Schafer and a COSPEC instrument, to measure gas levels above the volcano and coordinating their activities with Chris McKee and the RVO staff. The Cascades Volcanic Observatory announced their intention to *"send three volcanologists, a seismic system consisting of telemetered seismic stations and a PC-based data-acquisition and analysis system, several telemetered tiltmeters, and other deformation monitoring instrumentation, on Wednesday, 28th September."* Cathie Hickson also reported over the Internet that: *"The Canadian government made a decision on September 30th to purchase a COSPEC for the Rabaul Observatory".*

On Tuesday, 4th October, the following came from the Disaster Information Administrator, as part of a message regarding the Rabaul eruption:
1. *Joint govt./UNDP/UNICEF team on-site mission on 28 Sept reports disaster-affected area covered by ash (up to 80 cm of ashfall accumulation). Ash in the air leads to low visibility.*
2. *National implementation of evacuation has proven very effective with* ***only 4 dead.***
3. *Army rations distributed to 40,000 - 45,000 evacuees in evacuation centres.* ***No reports of disease outbreak.***

Forty thousand (plus) people evacuated with the loss of four lives (one life lost in a road accident; one life, it is rumoured, lost to volcanic lightning). There are often worse casualties in a Vancouver rush hour. Full marks to the RVO and emergency services in PNG. One wonders if we, in North America, could do as well.

Paul Metcalfe

BAITOUSHAN

For those curious about the Chinese volcano which is reported to be entering a period of increased activity, I have prepared the following summary. I am a Ph.D. student with Jim Gill, and I was at lake Tianchi, the caldera lake at Baitoushan volcano, during the summer of 1993. Our work is focused on the last major eruption (1039 +/- 10 A.D.). As far as I know we are the only Western geologists actively studying the volcano, though George Walker, Jim Whitford- Stark, and Mike McCurry have also done reconnaissance field work there. Machida et al. (1990) provide a summary of their preliminary work on the recent eruption.

Baitoushan is the (Chinese) name that we have used for the volcano since the first AGU abstract. It is variously known (romanized alphabet) as Paektusan or Baegdusan (Korean), Changbaishan or Baitoushan (Chinese) and Hakutosan (Japanese). Since the Chinese also use Changbaishan to denote the mountain range in which the volcano sits we chose Baitoushan as the name for the volcano.

We have obtained two wiggle-matched ^{14}C dates on trees carbonized during the eruption, the youngest of which is 1039 ±± 10 A.D. The age range from 750 to 960 A.D. quoted in the news report is the range of conventional ^{14}C dates obtained by Chinese workers. Three events since 1039 are mentioned in the literature: 1597, 1668, and 1702. The evidence for these events is from historical records, and we saw no evidence that these events deposited juvenile material. The Chinese geologists we spoke to thought that the events were probably phreatic explosions, possibly coupled with the sort of degassing now reported.

Our estimate of volume of ignimbrites and fallout tephra is commensurate with that quoted in the report. Using very conservative isopachs and the model of distal fallout proposed by Fierstein and Nathenson (1992) the bulk volume is 112 km^3. Using more reasonable isopachs (ones that encompass all data for distal tephra) the volume estimate is 230 km^3. 172 km^3, though too precise, is within the range of reason. The eruption is zoned from comendite, a peralkaline rhyolite, to trachyte. Comendite is the most volumetrically significant component.

Distribution and character of pyroclastic flows, tephra falls, and mud flows from the recent eruption (1039 AD event) reveal a real danger to the city of Baihe as well as to loggers and pumice miners in the forests on the flanks. In particular, Baihe is next to the Erdobaihe river which has its source in crater lake Tianchi, forming a natural channel for pyroclastic or mud flows. Pumice from the 1039 eruption is found in farmer's fields atop cliffs 20 m above the level of the town.

The UPI report contains internal inconsistencies and could be a reporter exaggerating facts to generate a news story, but if Baitoushan is indeed entering a period of heightened activity possibly presaging eruption then it should be closely monitored. The magnitude of the ca. 1000 year old eruption is not overstated, and the potential hazard to the people of Baihe and others in southern Jilin Province is great.

Charles Dunlap

Dunlap, C.E. and Gill, J.B. 1994. A major element, trace element, and isotopic study of the large-volume, chemically-zoned eruption of Baitoushan, 1010 AD. ICOG 8 Abstracts, USGS Circular 1107, p.87.

Schmincke, H.U. and Horn, S. 1993. The ca. 1000 A.D. eruption of Baitoushan volcano (China/North Korea). EOS 74, No. 43, p. 691.

Dunlap, C.E. and Gill, J.B. 1992. U/Th disequilibria in the large-volume, chemically-zoned eruption of Baitoushan, 1010 A.D. EOS 73, No. 43, p. 611.

Fierstein, J., and Nathenson, M. 1992. Another look at the calculation of fallout tephra volumes. Bulletin of Volcanology, 54, p.156-67.

Feng, M., Wei, H.C., McCurry, M., Walker, G.P.L., Whitford-Stark, J.L., Zhang, C., Zhang, Y. 1990. Baitoushan - Site of a major Holocene ignimbrite eruption in China. Eos 71, No. 43, p.1713.

Machida, H., Moriwaki, H., and Da-Chang, Z. (1990) The recent major eruption of Changbai volcano and its environmental effects. Geographical Reports of Tokyo Metropolitan University, 25, pp.1-20.

UPCOMING CONFERENCES AND SHORT COURSES

OCEAN BOREHOLE LABORATORIES INSTRUMENTATION AND SAMPLING WORKSHOP

December 13-14, 1994 in Miami, Florida

Convenors: K. Becker, Univ. Miami; B. Carson, Lehigh Univ.; J. Hildebrand (Scripps)
M. Purdy (Woods Hole)

Joint Oceanographic Institutions, Inc. and the U.S. Science Advisory Committee (JOI/USSAC) announce an interdisciplinary workshop to develop plans for long-term observation and innovative post-drilling science at Ocean Drilling Program (ODP) boreholes. The workshop will discuss: development of borehole instrumentation and re-entry techniques; collection and analysis of post-drilling data or samples to characterize boreholes; and installation of temporary or semi-permanent observatories in and around ocean boreholes. The workshop will consider the scientific impact of these activities for: deep earth structure and dynamics; fluid flow, heat loss, and evolution of physical properties in crust and sediments; and chemistry of formation waters and solid phases. Participants will delineate technical, logistical, and developmental requirements to meet these objectives. The workshop report will provide recommendations for a coherent science initiative. Scientists interested in seafloor instrumentation and data collection, but not previously involved with ODP, are encouraged to attend.

Contact: **Bobb Carson**
Department of Earth and Environmental Sciences
Lehigh University, 31 Williams Drive,
Bethlehem, PA 18015
Telephone: 610-758-3660; Fax: 610-758-3677
e-mail: BC00@lehigh.edu

INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS XXI GENERAL ASSEMBLY July 2-14, 1995 Boulder, Colorado

The General Assembly will be held on the campus of the University of Colorado (CU), in Boulder, Colorado, from July 2nd to 14th, 1995.

Call for Papers

A full call for papers for the assembly was published in the April 5, 1994 issue of *Eos*. A **sample abstract with detail submittal instructions** was included as part of the call for papers. **The camera-ready copy and 2 copies must be received by the American Geophysical Union by the February 1, 1995 abstract deadline**. AGU must receive a copy of your abstract to be considered for presentation at the Assembly.

Contributed papers on any topics related to geophysics are encouraged. Every individual scientist will be assured that at least one paper that he or she submits will be accepted for either an oral or poster presentation. Additional papers from the same presenters will be considered by the Program Committee.

International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) Sessions

V1 Origin of Large Igneous Provinces
Conveners: M. Coffin, Institute of Geophysics, University of Texas, Austin, TX 78759-8397, USA, tel. 1-512-471-8429, fax 1-512-471-8844, e-mail: Mikec@coffin.ig.utexas.edu (IAVCEI/USA), N. Arndt (IAVCEI,France), and J. Ludden (IAVCEI/Canada).

V2 Seafloor Volcanism
Convener: J. Delaney, School of Oceanography, University of Washington, Seattle, WA 98195, USA, tel. 1-206-232-4830, fax 1-206-543-6073, e-mail: jdelaney@(IAVCEI).

V3 Processes of Magma Ascent and Explosive Volcanism
Convener: S.N. Williams, Dept. of Geology, Arizona State University, Box 871404, Tempe, AZ 85287-1404, USA, tel 1-602-965-1438, fax 1-602-965-8102, e-mail: atsnw@asuvm.inre.asu.edu, (IAVCEI/USA).

V4 Evolution of Large Volcanic Systems
Conveners: J. Pallister, U.S. Geological Survey, MS 903, Denver Federal Center, Box 25046, Denver, CO 80225, USA, tel. 1-303-236-1023, fax 1-303-236-1414 (IAVCEI[U]SA), and K. Hon (IAVCEI/USA).

V5 Dynamics of the Magma/Hydrothermal Interface
Conveners: S. Ingebritsen, U.S. Geological Survey, MS 439, 345 Middlefield Rd., Menlo Park, CA 94025, USA, 1-415-329-4422, fax 1-415-329-4463, e-mail: seingebr@rcamnl.wr.usgs.gov (IAVCEI/USA), and C. Jaupart (IAVCEI/France).

V6 Arc Volcanism and Sedimentation
Conveners: R.V. Fisher, Dept of Geological Sciences, University of California, Santa Barbara, CA 93106, USA, tel. 1-805-893-3946, e-mail: fisher@magic.geol.ucsb.edu (IAVCEI/USA), and R. Cas (IAVCEI/Australia).

DYNAMICS OF THE MAGMA-HYDROTHERMAL INTERFACE
Special session, Thursday, Juiy 6, 1995

Steve Ingebritsen
U.S. Geological Survey
Menlo Park, California, U.S.A.
Fax 415-329-4463
seingebr@rcamnl.wr.usgs.gov

Claude Jaupart
Institut de Physique du Globe
Paris, France
Fax 33-1-4427-3373
cj@ccr.jussieu.fr

Geoscientists recognize chemical and isotopic evidence for magmatic contributions of mass to active and fossil hydrothermal systems, and very high rates of heat discharge from active magmatic-hydrothermal systems require efficient magma-groundwater heat exchange. However, transfer of mass and heat between magma bodies and groundwater remains less well-understood than transport within the magma and hydrothermal systems proper. This session will emphasize 1. Evidence for rates of magma-to-groundwater transport
2. The evolution of porosity and permeability in the near-magma environment
3. Conceptual and quantitative descriptions of magma-to-groundwater transport
4. Time scales for magmatic-hydrothermal systems.

We encourage papers that address magma-water heat exchange in the context of eruptions (explosive interaction) as well as those that deal with the more static hydrothermal problem (relatively continuous interaction).

Steve Ingebritsen

Fourth RIDGE Theoretical Institute
CRUSTAL FAULTING AND MAGMA EMPLACEMENT AT MID-OCEAN RIDGES
Granlibakken Conference Centre, Lake Tahoe, CA
June 11-16, 1995

Convenors: Roger Buck (LDEO),
Paul Delaney (USGS),
Jeffrey A. Karson (Duke)

Interactions between magmatism and faulting at ridge crests and related processes such as hydrothermal circulation are not well understood, but offer promise to explain some of the first-order topographic and structural features of mid-ocean ridges. The intrusion of magma changes the distribution of stresses in the lithosphere which in turn can affect the orientation and offset of normal faults. Faults cut the crust and mantle lithosphere at a ridge, and movement along these faults rotate the crust and produce much of the observed topographic relief close to ridges. Faulting also changes the stress field in the lithosphere and may affect where dikes intrude the crust. The 1995 RIDGE Theoretical Institute will focus on how the brittle lithosphere deforms at a spreading centre due both to faulting and the intrusion of magma. In particular, how the processes of faulting and magma intrusion influence the structure and topography of ridge crests. One goal is to bring together land geologists and theorists who have worked on problems of faulting and magmatism in volcanic rifts with scientists who study the structure and morphology of mid-ocean ridges in order to help develop a better theoretical framework within which to interpret ridge crest results. The Institute will be comprised (*sic*) of two parts:

1. Short Course (June 11-13): Open to all interested participants. Day 1 will provide an overview of the basic observations and theories of magma emplacement, faulting and the interactions between these processes, drawing especially on results from recent studies of continental and oceanic island volcanic rifts. During Day 2 an assessment will be made of what we know and do not know about the styles and rates of faulting and magma emplacement on spreading ridges and how these processes vary with spreading rate, crustal thickness, depth of seismicity and efficiency of hydrothermal cooling. Day 3 will focus on the state of models for how deformation and topographic relief are produced at ridges, with a particular emphasis on how faulting and diking processes interact.
2. Workshop (June 15-16): Limited attendance. A primary goal of the Workshop will be to consider ways of testing various faulting and intrusion models using data from on-going or planned RIDGE studies such as the Crustal Deformation Experiment component of the RIDGE Sea Floor Observatory or the proposed InterRidge 4D Crustal Architecture Experiment.

A day-long field trip to Owens Valley and the Mono Lake area, to view examples of faulting and volcanic activity, is also planned.

Application: **U.S. RIDGE Office**
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Tel: 508/457-2000 ext. 2587; Fax: 508/457-2150
email: ridge@copper.whoi.edu.

IAVCEI COMMISSION ON EXPLOSIVE VOLCANISM
WORKSHOP ON EXPLOSIVE ERUPTIONS IN PHONOLITIC MAGMAS

Tenerife, Canary Islands. April 23-30, 1995

Leaders: Joan Marti, Josep Mitjavila, Giray Ablay and Scott Bryan
Maximum 28 participants; cost about US $ 800.

The Canary Islands consist of seven volcanic islands located off the NW margin of Africa, where volcanism extends back over the last 20 million years. Tenerife, the largest island of the archipelago, was originally built up by fissure eruptions of ankaramites, basanites, and alkali-basalts forming the Old Basaltic Series (from 12 Ma to 3.3 Ma). Younger differentiated volcanics and basalts formed a large volcanic complex in the central part of Tenerife, where the existence of evolved phonolitic magmas indicates the development of high level magma chambers. The southern slopes of Tenerife form part of a shield structure (the Las Canadas edifice) in the central volcanic complex, and culminate in the walls of a large depression (the Las Canadas caldera) at an altitude of 2200 m. This depression was infilled by the products of a new volcanic edifice (the Teide-Pico Viejo stratovolcano, 3718 m), whose lavas were mainly emplaced along the northern slopes of the island. The Las Canadas caldera originated by multiple collapses which represent different destructive episodes in the upper part of the Las Canadas edifice, whose products appear along the caldera wall. The formation of the Las Canadas caldera took place during a long period which ranges approximately from 1.18 to 0.17 Ma.

This field workshop will spend seven days in Tenerife examining deposits derived from explosive eruptions of phonolitic magmas related to the evolution of the central volcanic complex and the formation of the Las Canadas caldera. We will reconstruct the volcanological history of the Las Canadas edifice and emphasize the stratigraphy, structure, eruption mechanisms and origin of its caldera. Characteristics of the welded rocks, the presence of magma mixing in some pyroclastic deposits, the emplacement mechanism of some ignimbrites and the distribution and characteristics of several plinian fall deposits will be examined in detail. Specific topics for discussion will be: topographic control on pyroclastic flows, origin and distinctive features of welded fallout deposits, influence of phreatomagmatic events in the formation of collapse calderas, structural evolution of collapse calderas, and geochemical evolution of phonolitic magma chambers.

23rd Arrival of participants and travel to the Parador de Las Canadas. Evening session: General introduction to the geology of Tenerife.
24th Overview of the Las Canadas caldera. Products of the 2020 a Montaqa Blanca sub-plinian eruption.
25th Teide-Pico Viejo post-caldera phonolitic complex
26th The Guajara sequence. Proximal facies of the Chimiche pyroclastics and characteristics of welded rocks (fall out deposits, clastogenic lavas and lava-like rocks).
27th The Diego Hernandez wall. Travel to the South and accommodation at Hotel El Medano.
28-29 Bandas del Sur pyroclastics
30th Departure

Applications to:
(by December 30th)

Joan Marti
Institute of Earth Sciences "Jaume Almera"
CSIC
c/ Marti i Franques s/n
08028 Barcelona (Spain)
tel.: -34-3-330 27 16; fax.: -34-3-411 00 12
E-mail. joan.marti@u.ija.csic.es

THIRD INTERNATIONAL DYKE CONFERENCE

September 4-8, 1995, Jerusalem, Israel

Gidon Baer (chairman), Ariel Heimann (Geological Survey of Israel),
Amotz Agnon (Hebrew University, Jerusalem, Israel)
Moshe Eyal, Yehuda Eyal (Ben Gurion University, Beer Sheva, Israel)
Henry Halls, Erindale College, University of Toronto, Canada.
Peter Rickwood, The University of New South Wales, Australia.

Suggested themes

1. Tectonic and geodynamic significance of dikes.
2. Mechanics of emplacement, magma flow and expulsion
3. Crustal evolution
4. Geophysical and geodetic aspects of dykes
5. Petrogenesis, palaeomagnetism and geochronology of dykes

Call for papers

January 31, 1995 - Receipt of manuscripts
May 31, 1995 - Receipt of abstracts

Schedule

September 1-3: Pre-conference field trip(3 days) to the northern Dead Sea Rift: the Galilee and Golan Heights volcanic fields, rift-related dyke swarms, and rift tectonics in northern Israel.
September 4-8: Conference meeting in Kibbutz Ramat Rachel convention centre, Jerusalem.
September 6: In-conference trip (1 day) to the Dead Sea and the Archaeological site of Massada (optional sightseeing tour in Jerusalem).
September 8-12: Post-conference trip (4.5 days) to the Negev desert (southern Israel): early Cretaceous radial dykes and associated sills in the Ramon erosional cirque, Precambrian dykes in the basement rocks of the Elat area, and rift tectonics in southern Israel.

Registration: Until May 31, 1995 - US $300. After May 31, 1995 - $350. Student Fee - $150.
Pre-conference trip $250 (accommodation and meals included).
Post-conference trip $400 (accommodation and meals included)

Dr. Gidon Baer / Dr. Ariel Heimann
Geological Survey of Israel
30 Malkhe Israel St.
Jerusalem 95501
ISRAEL
Tel: 972-2-314231, 972-2-314254
Fax: 972-2-380688
E-mail: DIKECONF@VMS.GSI.GOV.IL

Mineralogical Society of America Short Course
STRUCTURE, DYNAMICS, AND PROPERTIES OF SILICATE MELTS
December 9-10, 1995 (immediately preceding the Fall AGU meeting)
San Francisco area, California

D.B. Dingwell
Bayerisches Geoinstitut Universitaet Bayreuth
95440 Bayreuth, Germany
don.dingwell@uni-bayreuth.de

P.F. McMillan
Dept. of Chemistry
Arizona State University
Tempe AZ 85287 USA
mcmillan@asuchm.la.asu.edu

J.F. Stebbins
Dept. of Geological and Environmental Sciences
Stanford University
Stanford CA 94305, USA
stebbins@pangea.stanford.edu

Silicate melts are the essential phase of all magmatic processes. As such, melts play a key role in the chemical and physical differentiation of the Earth and terrestrial planets, as well as in more local phenomena of volcanism, plutonism, and heat and mass transfer in the crust and mantle. Equally important to this field has been the impetus provided by the use of silicate liquids and glasses in various industries. The past ten years have witnessed a tremendous growth of the literature on the structure, properties, and dynamics of silicate melts, stimulated by a number of breakthroughs in fundamental understanding.

This short course will attempt to bring these new results and approaches to students and other researchers in the earth and the materials sciences. Emphasis will be placed on new findings from high T studies of liquids, on the dynamical processes that distinguish liquids from glasses, and the links between thermodynamic and transport properties.

Preliminary list of topics

C.A. Angell (Arizona State University): Phenomenology of strong and fragile liquids and the glass transition

G.E. Brown (Stanford University), G. Calas (Universite de Paris VII): X-ray spectroscopic studies of silicate melts

S. Chakraborty (Universitaet zu Koeln): Diffusion in silicate liquids

J. Dickinson (Corning, Inc.): Oxide glasses and melts: technological perspectives

D.B. Dingwell (Bayerisches Geoinstitut): Rheology and relaxation in melts

P. Hess (Brown University): Thermodynamic mixing properties and structure of silicate melts

P.F. McMillan and G.H. Wolf (Arizona State University): Vibrational studies of silicate liquids

C.T. Moynihan (Rensselaer Polytechnic Institute): Structural, electrical relaxation, and the glass transition

A. Navrotsky (Princeton University): Energetics of silicate melts

P.H. Poole (Dalhousie University), G.H. Wolf, and P.F. McMillan (Arizona State University): Computer simulations of melts

P. Richet, Y. Bottinga (Institut de Physique du Globe de Paris) Configurational entropy and viscosity of silicate melts

J.F. Stebbins (Stanford University): Dynamics and structure of silicate melts: nuclear magnetic resonance studies

S. Webb and D.B. Dingwell (Bayerisches Geoinstitut): Anelasticity of silicate melts

G.H. Wolf and P.F. McMillan (Arizona State University): Pressure effects on melt structure and dynamics

PAN PACIFIC HAZARDS '96
Coexisting with natural hazards: how can we survive within the Pacific Rim?
A Conference on Earthquakes, Volcanoes and Tsunamis
July 29 - August 2, 1996
Vancouver, British Columbia

This international conference will exchange technology, experience, and practical knowledge of disaster management. It will go beyond conventional discussions of response stories and risk analysis to explore strategies for prevention and mitigation. This will be accomplished by bringing together the contrasting perspectives of different disciplines, countries and agencies.

Who should attend:
Scientists, Geologists and Geophysicists*, Planners, Researchers, Managers, Elected Officials, Program Administrators, Educators, Engineers, Emergency Responders, Consultants, Health & Safety Professionals, Risk Managers, Government and International Agencies,
Policy Developers, Equipment Exhibitors, Students, Non-Governmental Organizations, Recovery Experts, Social Service Personnel, Human Resource Professionals, General Insurance Personnel

Suggested topics:
Risk Communication; Critical Incident Stress Debriefing; Volcanoes; Population Relocation; Earthquakes; Hazard Mitigation; Geotechnical Research; Warning Systems; Emergency Communications; Information Networks; Medical & Health Issues; Social Organizations; Government Regulatory Issues; Business Recovery; International Cooperation; Public Education; Exercises; Preparedness and Planning; Lifelines; Tsunamis; Information Management; Secondary Hazards; Land Use Planning; Sustainable Development; Property Insurance; Geoscience Research.

Session types:
Panel Discussions+ Plenary Sessions+ Workshops+ Technical Tours+ Poster Sessions+ Public Forums+ Technical Exhibits

Information from:

Conference Chair
Disaster Preparedness Resources Centre
University of British Columbia
2206 East Mall, 4th Floor
Vancouver, B.C. V6T 1Z3
Canada
Tel: (604)822-5518 FAX: (604)822-6164
E-Mail: dprc@unixg.ubc.ca

(I think they're implying that geologists and geophysicists aren't scientists - Ed.)*

And last, but far from least: **GAC VICTORIA '95.** Abstract deadline - December 1st. ***(Don't forget the special session "Volcanic activity in extensional zones").***

DIVISION FIELD TRIPS

SOUTH-CENTRAL NEOGENE TO HOLOCENE VOLCANISM IN THE CANADIAN CORDILLERA

Leaders: **Dr. Catherine Hickson, Dr. Paul Metcalfe,** Geological Survey of Canada, Cordilleran Division
(604) 666-3955 or **666-1129, FAX 666-1124**

Premeeting Trip: 5 days, May 12 - 16. Approximate cost $495.00

This field trip will focus on the immense variety of volcanic rocks and processes found within the southern Canadian Cordillera. The trip will be run as a circle tour, starting in Vancouver. Heading east past Mount Baker through the active Cascade Magmatic Belt the first stops will be to look at 22 Ma Coquihalla complex. The trip will head north to the Wells Gray Volcanic Field then swing west and south back through the Garibaldi Volcanic Belt, the northern part of the Cascade Arc. Localities visited will demonstrate sub- and intraglacial volcanism, volcano-glacial and volcano-fluvial interactions including secondary debris flows, slope hazards, various types of subaerial pyroclastic deposits and resultant volcanic hazards, all set against the spectacular backdrop of British Columbia's Interior Plateau and Coast Ranges. The trip will be on interest to researchers in volcanic processes, volcanic hazards, Cordilleran magmatism, and to those looking for a fun filled five days of volcanoes!

MOUNT SAINT HELENS: A 15 YEAR RETROSPECTIVE

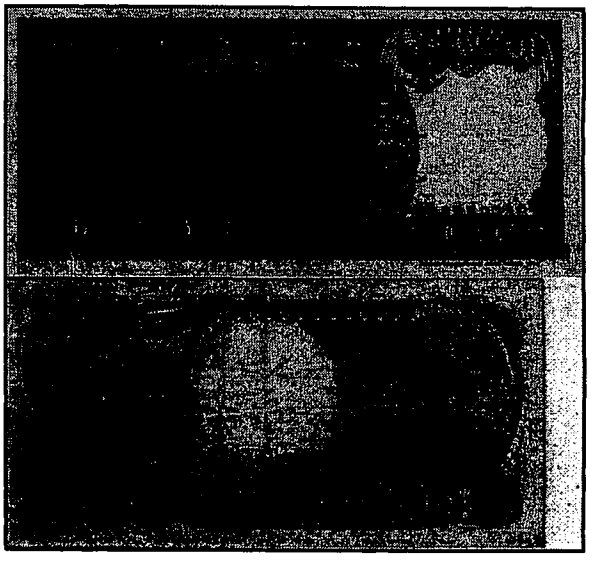
Leader: **Dr. Catherine Hickson,** Geological Survey of Canada, Cordilleran Division
(604) 666-3955 FAX 666-1124

Postmeeting Trip: 3 days, May 19 - 21. Approximate cost: $300.00

1995 will mark the 15th Anniversary of the May 18th eruption of Mount St. Helens. Catherine Hickson, a witness of this event, will guide participants around the mountain recreating events of 15 years ago as well as investigating the geomorphic changes that have occurred over the intervening 15 years. New access, due to open for the 15th anniversary will allow field trip participants to drive to Coldwater Ridge and give direct access to the Pumice Plains and debris avalanche deposits. Access to the dome may also be possible. The trip will also include a visit to magnificent interpretative centre opened May 1993. This trip will be of interest to physical volcanologists, geomorphologists and hydrogeologists as well as anyone interested in volcanoes.

EJECTA

A odds and ends to amuse you at the end of this somewhat lengthy newsletter. Just to show you that the Pacific Rim countries take volcanology very seriously, I will tender here some current (pun intended) volcanoes, courtesy of Lindsay Bottomer, Echo Bay Mines.



One last request - does Anyone Out There have all the copies of ***Ash Fall*** from #1? If so, please contact me - we're missing a few and would like to keep a complete set for posterity. I fear they all went for kitty litter, but.....

I was going to stuff in one last cartoon here but no room - I'll have to save it for #37. I think I remembered everything else we had to include in this edition. Looking objectively at Canada Post (among others), I realize that I'd better take this opportunity of wishing all of you, on behalf of Cathie, myself and the rest of the exec., all the best for Christmas and for a prosperous New Year.

Paul