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

#42 FEBRUARY 1997

Executive Message

I'd like to use a small portion of this newsletter to welcome in our new executive and to update the membership with some of our recent activities. Furthermore, I will take this opportunity to encourage people with interests in volcanology, igneous petrology or related sub-disciplines to join the VIP division of the GAC and to participate in our activities.

In the spring of 1996 we elected a new executive. Before introducing the new executive to you, I wish to thank our outgoing Chair (Past Chair), Cathie Hickson, for the leadership and energy she has given our organization for the past 5 years. During her time as Chair, Cathie infused the division with a new vitality and was instrumental in establishing the VIP medals for excellence: Career Achievement and Gelinas Medals. These awards have given us a means of recognizing some of the excellent volcanological and petrological research being done in Canada. The good news for me is that, thanks to her efforts, I inherit a healthy and vital organization. The bad news is that these are an awfully big pair of shoes that I've been lent.

Helping me fill these shoes is a very capable executive who will serve until 1998, at least. Vice-Chair is Georgia Pe-Piper from St. Mary's University. Ned Chown at University of Quebec at Chicoutimi will serve as Secretary/Treasurer. We have three councillors representing western, central and eastern Canada: Paul Metcalfe, Tom Pearce and John Stix.

What is the mission of the VIP division? Basically, our aim is to highlight, promote, encourage and to some extent communicate volcanological activities in Canada. The activities of the division reflect these goals (if they don't let us know). Our regular activities include:

a)production and circulation of the Ashfall Newsletter,

b) organization of volcanological special sessions at the annual GAC/MAC meeting,

c) organization of an annual meeting of the division (also at the annual GAC/MAC meeting), and

d) collecting nominations for VIP medals of excellence and adjudication of these prizes.

You will find additional details on all of these activities in our newsletter below.

There also exist several less regular activities which we would like to continue supporting. These include topical field trips, short courses or workshops associated with conferences. In the past, the division has been associated with such activities and we hope to be able to continue that tradition.

VIP On The WWW

We have started a WEB site for the division [http://perseus.geology.ubc.ca /~russell /GAC_volc/]. Please check it out and give us feedback. This site can accomplish much for us. For example, it: a) advertises our organization and its activities, b) advertises upcoming events, and c) allows people to join the membership electronically ($6 can't beat it). We are also investigating whether or not to allow members to put links to their home page on our site. We envisage having a WWW based list of members for those members who would like to be listed and specifically request it. You now have direct access to the new executive via the Internet. Pass on your best ideas and help us keep the VIP division of the GAC alive and well!

Special Sessions

As mentioned above the VIP division sponsors special sessions at the annual GAC/MAC meetings. At this point we have sponsored a special session for each of the next two GAC/MAC meetings [http: // perseus.geology.ubc.ca/~russell/GAC_volc/ sessions.html].

1997 Ottawa: **CONNECTIONS: Volcanic Behaviour and Igneous Petrology**. convened by: J.K. Russell & T.H. Pearce.

1998 Quebec: **Processes in Physical Volcanology and Volcaniclastic Sedimentation: Modern and Ancient**. convened by: Wulf Mueller, John Stix and Phil Thurston.

We are looking for suggestions for special sessions at subsequent meetings. Please visit our web site and send us ideas. Alternatively, show up to the VIP division meeting which will be held at this year's GAC/MAC meeting in Ottawa and give us your input. **Business Meeting**

We have scheduled a business meeting for the division to be held at the Ottawa 1997 GAC/MAC conference. This meeting will be used to address future sponsorships of: a) Special Sessions/Symposia, b) short-courses, or c) field trips.

Date: Monday, May 19, 1997

Time: 16:00 - 18:00 hrs

Room: TBA

MESSAGE FROM THE EDITOR

I note in an old Ashfall, that the centre of gravity of the Division had gone west. The most recent election has resulted in a far-flung executive with the president and past-president on the west coast and the vice president and secretary on eastern tidewater. All contact is now electronic, and our president has built us a web page.

The passage from one executive to the next is often a bit slow, as our annual meeting takes place in May and we all trot off to the field immediately after. Paul Metcalfe and I are no exception, he being extremely busy, and I being very slack, and it has taken some time to transfer the Division files. We are now up and running. This Ashfall comes a bit late, we normally should have this in your hands early in the new year for the important announcements concerning our annual awards. The awards were announced in Geolog, and I have sent the award announcement independently to some Canadian Geology Departments, so we hope to have a slate of potential honourees. Nominations are open until the end of February, so please make an effort to nominate! If possible advise me or Kelly by telephone, fax or E-mail that a nomination is coming in. Another item of business is a call from IAVCEI for individual memberships. I have a small number of "official" forms available for purists, but I'm sure the facsimile copy included at the end of this Ashfall will be acceptable if accompanied by the requisite number of Ozbucks, The original is a volcanic sulphur-yellow and printed on International length paper, should you wish to correct my errors at your local copy shop.

As with any change in management, the executive invites your input as to future concerns of the Division, and the editor, in particular, invites contributions as well as suggestions for features to include or to abandon in Ashfall. I'm learning a new computer system and hope to add a few improvements of my own in future issues.

Headquarters promises me E-mail addresses on the next membership list, but I would prefer to have confirmation from individuals that they wish to receive Ashfall this way. Since Headquarters has my E-mail address wrong, yours could be wrong too! Just let me know ehchown@uqac.uquebec.ca. It may also be advisable to tell me if you are using Mac or PC, I use both.

ANNOUNCING, UPCOMING SESSION AT GAC/MAC 98, QUEBEC CITY PROCESSES IN PHYSICAL VOLCANOLOGY AND VOLCANICLASTIC SEDIMENTATION: MODERN AND ANCIENT

Conveners:

Wulf U. Mueller, Université du Québec à Chicoutimi;

John Stix, Université de Montréal;

P. Thurston, Ontario Geological Survey

The session will address volcanic processes occurring on subaerial to subaqueous volcanic edifices as well as their associated reworked counterparts. Recognition of primary pyroclastic debris in the ancient rock record is problematic and a comparison with modern subaerial to subaqueous edifices in various plate tectonic settings is a necessity. Important aspects include dome growth and subsequent collapse, sector collapse causing debris avalanche deposits, and catastrophic climatic events commonly responsible for lahar deposition. Transport mechanisms associated with paroxysmal eruptions, edifice collapse, or reworking processes will be discussed. All these are integral components of volcanic stratigraphy. In addition, pyroclastic deposits and internal geometry of volcanic edifices are important criteria for hazard assessment as well as being significant for targeting massive sulfide deposits. A wide range of themes is addressed and researchers are encouraged to present their data so that fruitful cross-pollination between the domains of physical volcanology and sedimentology may be achieved.

PROCEEDINGS OF THE SAPPORO INTERNATIONAL CONFERENCE ON"MINERAL RESOURCES OF THE NW PACIFIC RIM" 1994

Resource Geology Special Issue No. 18; S. Ishihara, G.K. Czamanske eds. 1995; Published by the Society of Resource Geology, Tokyo. 6000 yen

The volume contains 25 articles presented at the i994 conference, all but two of them short (5-12 pages). The two exceptions are an extensive description of the Noril'sk deposits by Czamanske and co-authors and a multi-authored article on plutonic gold ores in Alaska. The editors acknowledge that the Noril'sk district is not part of the Pacific Rim, but that the paucity of non-Russian literature on the deposits justifies its inclusion. A wise decision, the article is comprehensive and well-written, and contains a wealth of detailed information.

The papers cover a wide range of subjects, from regional metallogeny to detailed district descriptions stretching from Southern Hokkaido to Alaska. This includes both the outer arcs and inner deformed belts of China, Mongolia and Siberia. The emphasis is on

pluton-related ores, porphyry, skarn, greisen and epithermal deposits of a variety of types.

The book is a high-quality reproduction, the articles are for the most part well illustrated and comprehensible. Unfortunately most of the Chinese and Russian contributions suffer from illustrations that are poorly conceived and some were submitted too late for the editors to perform much cosmetic surgery. As a result the inner deformed zones of the NE Pacific Rim remain somewhat obscure.

Canadian readers searching for analogies in the Cordillera will find immediate application of these studies, and those working in older terrains should find the book a useful introduction to Recent analogues an the inclusion of the Noril'sk study makes the book attractive to those who specialize in Ni-Cu deposits.

FIELD TRIPS

The Division has no official field trips lined up for the moment, but I call your attention to two trips available this spring and summer through the Geological Society of America. (Slightly higher price for non-members).

Geotrip **Italy's Volcanoes** May 3-11 Great trip for anyone who missed the Division's trip there in 1989 (will the courier have Gucci loafers?)

Geohostel **Mount St Helens and Mount Rainier** June 21-26 1997 For those who may have missed the Victoria GAC trip.

For information call 1-800-447-2020, x134

SAKURAJIMA, Southern Kyushu (31o+35'06"N, 130o39'25"E) (October 2, 1996)

Seismological activity at Sakurajima Volcano which has been monitored by SVO (Sakurajima Volcanological Observatory, KYOTO University) indicates occurrence of four explosions in June, one in July, and five in September.

According to JMA, forty two explosions occurred in January, including 18 explosions during 24-31 January. Thirty-one explosions in February; at 20:11 JST on 27 Feb. cinders reached the middle of the volcano slope. March had 69 explosions; the fifth largest record of monthly explosion frequency since October 1995 when eruption started at the Minami-dake, the present active center. Three explosions among them were recognized to be associated with cinder spout. Twelve explosions on 18 March was the second largest record of daily frequency since 1995. The activity had declined since then, with 5 small explosions in April and one in May. The explosion on 16 May spouted large cinders to the NW, 2 km away from the crater.

According to SVO, amounts of air-fall tephra, explosion frequency, and earthquakes of BL type, together with the activity of surface and shallow earthquakes, had reduced since March. Long-term evaluation on the activity by SVO based on their monitoring results, including sea-level change and GPS observations, that accumulation of magma just below Sakurajima Volcano has advanced slowly and steadily since 1994.

Sakurajima exploded strongly in August and October. On 25 August, volcanic bombs landed on the mid-slope of the volcano. The eruption column reached up to 3 km. Tephra covered widely the northern area, including Kagoshima City, causing heavy traffic damage. Eruptions at Sakurajima Volcano occurred more than 200 times in 1995; the most active of the past four years. Total amount of erupted materials during 1995 is estimated approximately 3 - 4 million tons, according to the Sakurajima Volcanological Observatory (SVO), Kyoto University which is observing the continuous uplift of the northern side of Sakurajima, implying accumulation of magma beneath the volcano, and potential explosive eruption in the near future.

Jökulhlaup on Skeiðarársandur from the Grímsvötn caldera

The Vatnajökull glacier in Europe is a temperate glacier covering about 8300 km2 in the SE part of Iceland. Volcanic fissure systems of the Mid-Atlantic Ridge plate boundary are partly covered by the western part of the ice sheet. Two major volcanic centers lie beneath the ice, the Bardarbunga volcanic centre and the Grimsvotn volcanic centre both with large subglacial caldera depressions. The Bardarbunga centre is a part of a fissure system extending over 100 km to the south and some 50 km to the north of the glacier. The last eruption within the Bardarbunga centre occurred in 1910, but eruptions on the fissure system have occurred in 871 AD, 1477 AD and 1862 AD, all producing substantial amounts of lava.

The Grimsvotn centre is the more active of the two with an eruption frequency during past centuries close to one eruption per decade. The last eruption occurred in 1983. As Bardarbunga the Grimsvotn centre is a part of a fissure system which includes the Laki fissure, which in 1783 produced about 12-14 km3 of basaltic lava. Within the ice filled Grimsvotn caldera intense geothermal activity continuously melts the ice to form a subglacial lake, which at intervals of 5 to 10 years is emptied along subglacial channels to create large floods (Jökulhlaup) on the sandur plain, Skeidararsandur, on the Icelandic south coast. The lake was last emptied in 1996 and the water level is presently low.

The present eruption fissure is located between these two volcanic centres with a direction parallel to the regional tectonic lineament. The subglacial topography directs meltwater from the erupting fissure toward the Grimsvoetn caldera which is rapidly filling. By the evening of Oct. 1st the ice

cover above the subglacial lake had risen 10-15 meters. A rise of the water level by additional 35 meters will trigger a flood.

On September 29, 1996 at 10:48 an earthquake of magnitude 5 on the Richter scale was detected within the Vatnajökull icecap in SE Iceland. This event was followed by an intense earthquake swarm with a large number of small events with intermittent larger quakes of magnitude 3-4 on the Richter scale. The activity continued at similar level until shortly before midnight on September 30th when volcanic tremor was recorded and earthquake shocks became less frequent. In the afternoon of September 29 a warning was issued to national and international aviation authorities that an explosive (phreatic) eruption might be expected within the near future and an ash cloud might interfere with the dense air traffic across the Atlantic.

In the morning of October 1st an over flight discovered a subsidence bowl in the glacier surface at a location where an eruption had occurred in 1938. More or less continuous over flights during the day observed continuous increase in the size and depth of the initial subsidence bowl as three additional bowls formed on a line N30E indicating intensive melting at the base of the glacier along a fissure 5-6 km long. Simultaneously the ice cover on the 10 km diameter Grímsvotn caldera some 15 km to the south of the active subglacial fissure started to rise indicating that melt water from the eruption was flowing into the caldera depression and lifting its ice cover.

On Oct 2nd, in the early morning, an over flight observed that the eruption had broken through the ice. Rhythmic explosions resulted in black ash clouds rising to a height of 500 meters while the buoyant eruption column rose to 3000 meters before being deflected by a southerly wind at a velocity of 30-40 knots. Visibility and flying conditions were extremely poor and allowed observation for only a few minutes.

7th. of November 1996 Jokulhlaup started on the morning of November the 5th. quite abruptly. The growth was fast and many icebergs were floating in the flood water from the glacier reaching all the way to the sea. Grimsvotn tremors started at 21:30 on Monday 4th Nov, the Jokulhlaup came out of the glacier 11 hrs later. Distance is about 50 km from Grimsvotn to the Skeidararsandur. The discharge growth was more sudden than was ever expected to be possible. While all was quiet at 0800 the flood had increased its discharge 80-100 times in less than 2 hours.

The estimated peak-flow was around 45.000 m3/s, that is about 10.000 to 15.000 m3/s higher than in the Jokulhlaups of 1934 and 1938. Flood peak was reached at about 2300 hrs. The flood has been decreasing rapidly since 2300 hrs on 5th of Nov. The flood channel from Grimsvotn caldera can be clearly seen. It forms a depression like structure on the surface of the glacier dotted with several holes. It is estimated that the Grimsvotn lake has been totally emptied, since the glacier seal has been destroyed due to melting of the water. This has never occurred in Grimsvotn before. Such high melting can only be associated with lake water temperature greater or equal to 10 deg. Celsius. It is now clear that the total damages are about 10-15 mil. US$,

A small eruption started in Bardarbunga around 1300 hrs on 6th of Nov. The eruption lasted for about 20 to 30 min. According to seismograms at the Meteorological office, the eruption was initiated by some intrusive activity. The intrusive activity is based on recorded eruption tremor picked up by one of the seismometers. Eruption column reached about 4 km in to the air. Relation between pressure decrease due to the flooding have been suggested as the main cause of the eruption.

Mt. Etna's activity from 15 November to 31 December 1995

The summit craters of Mt. Etna volcano remained in a quiescent state after the 3rd episode. The Northeast Crater (NEC) was closed by spatters fell back into the crater and no vent was observed inside, only a few large cracks opened on the welded spatter crust emitted fumes. Bocca Nuova (BN) crater showed a normal continuous degassing, Southeast Crater (SEC) and Voragine (VOR) craters did not change their continuous steam emission.

Since the late evening of 22 November continuous glows were observed at NEC and some bangs were heard as well from the lower slopes of Mt. Etna. Around midnight, a new eruptive episode, the fourth one, occurred at NEC nine days after the third one. Fire fountaining lasted two hours and the intense red glows were visible from Catania. The lava jets remained fairly low (about 100 m above the crater rim) so the proximal spatter deposit mantled only the upper part of the cone whereas the fine material was carried out by the wind and fell on the south-eastern flank of the volcano up to the coast. However, the total volume of the erupted material was limited to a few tens of thousand cubic metres, close to that of the second episode. After the 4th eruptive episode the vent was closed again by material fallen back into the crater. Three days after some bangs were heard again at NEC and glows were observed during the night between 26 and 27 November.

In the morning of 27 the seismic tremor rose suddenly and at 7:15 an ash and lapilli column rose up the volcano. Because the Mt. Etna summit was covered by clouds direct observation of the phenomena was prevented. Ash and lapilli were carried by the strong wind northward and fell on a

narrow band of the N flank of the volcano down to its foot . The lapilli fallout ended around 10:00 but the explosive activity at NEC went ahead for several hours. Strong blasts were heard several km apart and waned during the day. The thickness of the scoria fall deposit varied from some decimetres close to the vent to about 1 mm at 12 km apart, the total volume of the 5th eruptive episode was estimated at 0.4-0.5 million cubic meter. The recognition at NEC performed two days after, revealed that the proximal spatter deposits of 4th and 5th lava fountain episodes were less thick than the former ones. Lithic blocks were less abundant than those of the 9 November episode and the large ballistic scoriaceous bombs were found up to 500 m far from the vent. The crater bottom was completely sealed by the welded spatter fallen back, but every 40-60 minutes a gas pocket released from the cooling magma inside the conduit broke the solid crust and a single lava bubble blew up. These phenomena, strongly different in style from Strombolian explosions, were observed for some more days at NEC.

In the first half of December summit craters of Mt. Etna were in a quiescent condition with a continuous steam emission from their degassing vents. Explosive activity gradually increased till 16 Dec. when a continuous Strombolian activity was observed at a small vent inside the NEC bottom. In a few days a Strombolian cone grew around the vent. The explosive activity was characterized by the bursting of single magma bubbles alternating to jets of gas and spatters lasting some tens of second and to a few minutes of degassing. This intense Strombolian activity continued for some days.

In the late morning of 23 Dec. around 11:00 strong bangs were heard from people skiing on the upper volcano slope. Very soon the bangs became frequent and black ash puffs were observed at NEC. Between 12:15 and 12:20 the first jet of magma grew above the crater rim. In very short time several pulse of magma jets followed each other and a big eruptive column rose on the volcano summit.

Between 12:35 and 13:05 the paroxysmal phase occurred, the jets of magma reached 500-600 m of altitude and the fragments produced from the top of the jets fed a quasi-sustained eruptive column that reached 9.5 km of altitude (6.2 km above the volcano summit) measured at the buoyancy level where white steam separated from the eruptive mixture and lapilli fell down. The very good weather conditions allowed observation of the eruptive column from many parts of Sicily. The column was bent about 40 degrees downwind toward east-northeast. Abundant ash and lapilli rained on a wide band of the NE flank of the volcano down to the coast. Brownish ash plume was emitted by VOR during the entire paroxysmal phase of the eruption. Around 13:30 the eruption quickly decreased of intensity, but isolated explosions still occurred until the evening. This episode was the most energetic of the six at NEC between November and December 1995.

The proximal deposit of the eruption mantled the NEC cone with a some metres of thick welded spatter. In the western and eastern saddles between NEC and the Central Cone spatter flowed forming two rootless lava flows a few hundred metres long. The eastern flow was still active during the night of 23 Dec. and the downslope movement of still fluid material in the core produced a continuous collapse of large incandescent blocks at the flow front.

The morphology of the crater was deeply modified both for the addition of a thick new scoria bank, the southern crater rim was widened and lowered. Ballistic clasts as cowsheet bombs large up to 2 m in diameter, had been thrown up to 600m from the vent. The distal deposit which fell from the eruptive column was made of scoriaceous bombs and lapilli up to 10-15 km from the vent, and from lapilli and a minor ash up to the shoreline, 22 km away. The bombs were very brittle, flat and up to 30cm in diameter 6km from the vent, and broke up on impact landing still hot, only by direct witness observations confirmed the maximum dimension of the clasts.

The scoria fall deposit covered an area from the vent to the coast producing major damage to fruit plantations and minor damage to vehicles and buildings. The Messina-Catania freeway was covered by the scoria deposit along a 4 km long band. The deposit thickness along the main dispersal was 6-7 cm at 6km, 3-4 cm at 13km, 3 cm at 16km along the freeway, and 1-2 cm at 20km close to the coast. The estimate total volume of pyroclastics erupted is about 3 million cubic metres.

Mauro Coltelli, Massimo Pompilio & Paola Del Carlo CNR - Istituto Internazionale di Vulcanologia .

CALL FOR NOMINATIONS
1997 AWARDS OF THE VOLCANOLOGY AND IGNEOUS PETROLOGY DIVISION

Career Achievement Award

A medal for Career Achievement is awarded by the Division Volcanology and Igneous Petrology of the Geological Association of Canada in recognition of career achievements in the field of volcanology and/or igneous petrology. Candidates are judged on their lifetime scientific contribution. The award is made only when a suitable candidate is found who is judged to have made major contributions to basic knowledge or clear and significant breakthroughs in volcanology or igneous petrology.

***Nomination Procedure*:** Nominations for this award are due in January, and should be sent to the Secretary-treasurer, Division of Volcanology and Igneous Petrology. The nomination should include the nominee's curriculum vitae and a clear statement from the nominator describing the candidates significant contribution to the field. Each candidate will be considered three consecutive years.

Leopold Gelinas Awards

The Volcanology and Igneous Petrology Division of the Geological Association of Canada annually presents two medals for the most outstanding theses, written by Canadian or submitted to Canadian universities, which have contents that are at least 50% volcanological or igneous petrology related. A gold (plated) medal is awarded for the best Ph.D. thesis and a silver medal is awarded for the best M.Sc. thesis. Nominated theses are evaluated on the basis of originality, validity of concepts, organisation and presentation of data, understanding of volcanology, and/or igneous petrology, and depth of research. Awards will not be made if the panel of judges considers that there are no worthy nominations.

***Nomination Procedure**:* Nominations for this award are due in February, and should be sent to the Secretary-treasurer, Division of Volcanology and Igneous Petrology. The nomination must include a copy of the thesis (to be returned), a letter of nomination which must include a clear statement from the nominator describing the contribution the thesis makes to the field of volcanology and/or igneous petrology.

Secretary-Treasurer E.H Chown
Sciences de la Terre
Universite du Quebec a Chicoutimi
Chicoutimi, Quebec, G7H 2B1
Phone: (418) 545-5011-5053
FAX: (418) 545-5012
email: ehchown@uqac.uquebec.ca

(please post)