ASH FALL

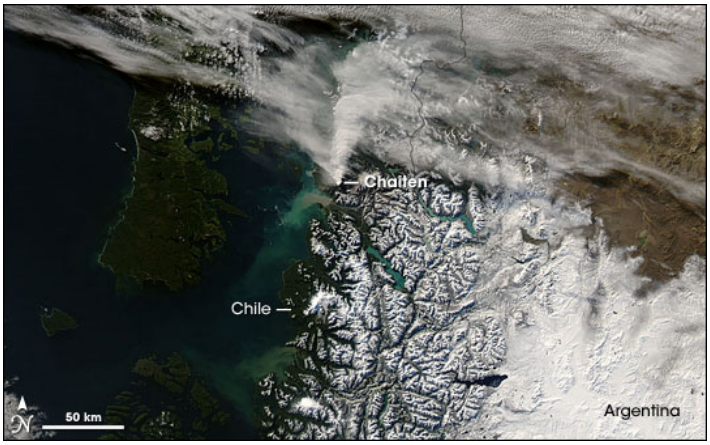
Newsletter of the Volcanology and Igneous Petrology Division
Geological Association of Canada

No. 68 June 11, 2008

From the Editor

In this issue of Ashfall we have a report from a field trip to the Lesser Antilles by students at Université Laval. We also have the VIP financial statement and more importantly the citations and responses for this years awards. In future issues we will also be publishing a revised version of the VIP constitution as we have to make some changes to keep GAC happy. Of course it will be much harder to produce the next issue without your help. Please send along any articles you would like to see included in Ashfall. This can include trip reports, more scholarly articles or just some cool photos.

There has been at least one major eruption in the news lately. On May 2, 2008 Chaitén Volcano in southeastern Chile erupted for the first time since ~7400 BC. The initial ash column reached a height of 17km, blanketed the nearby town of Chaitén in ash and caused the evacuation of some 4000 people. There are some good photos of the eruption at geology.com whereas the Daily Mail online site has some spectacular photos of lightning associated with the eruption.



This image was captured on May 19, 2008, by the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite. The picture shows the volcano's plume blowing toward the north-northeast and mixing with nearby clouds. To the south, skies are clear, and reveal a wide expanse of snow cover over Argentina. Image from the NASA Earth Observatory web site.

These two spectacular UPI photos taken by Carlos Guttierez are taken from the Daily Mail online site. They show the lightning storms associated with the recent pyroclastic eruptions.

A tropical excursion in the Guadeloupe archipelago: geological and engineering aspects of the Lesser Antilles volcanic arc

By Émilie Bédard, Michelle Deakin, Marie-Hélène Fillion and Jean-François Montreuil

Université Laval, Québec.

Introduction

The islands of Guadeloupe are included in the Lesser Antilles, a more than 850 km long oceanic volcanic arc (Fig. 1). These islands mainly consist of volcanic and sedimentary deposits overlying older oceanic crust. They are the surface expression of a subduction zone located approximately 150 km east of the arc itself, where the North and South-American plates plunge beneath the Caribbean plate. This tectonic setting thus implies regionally important seismicity and intense volcanic activity, as well as geotechnical problems (i.e., rock fall/slide hazard) and benefits (i.e., geothermal energy). The Guadeloupe islands are quite unique in that they offer a complete overview of the Lesser Antilles arc geology, thus providing a natural laboratory to study the dynamics of an active oceanic arc.

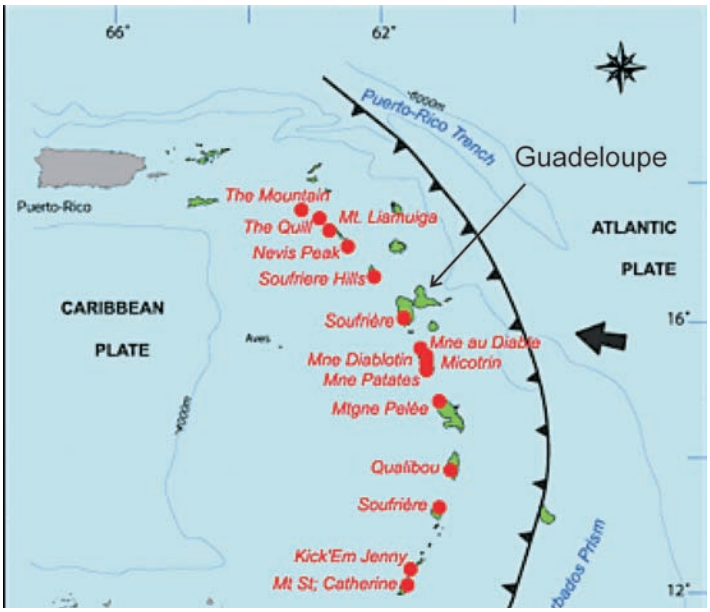


Figure 1 – Lesser Antilles volcanic arc with the main volcanoes (After www.volcanodiscovery.com).

The objective of this 7 day fieldtrip (February 23 – March 1, 2008) in Guadeloupe was to grant us students the opportunity to observe geological phenomena otherwise only seen in textbooks. Particularly, this excursion allowed us to learn about modern active volcanic environments, somewhat lacking in North America. And what better place than Guadeloupe for an outdoor classroom!

Day 1 – Bouillante's geothermal power station

During the first day of the fieldtrip, we visited the geothermal power station of Bouillante (Fig. 2), with the assistance of Mr. Jules Cairo, the plant manager. This visit was very instructive in gaining a better understanding of the challenges related to the operation of a geothermal power plant, from the exploration stage to the final stages of electricity production. Of interest was also the negative effects of thermal water emergence on modern buildings.

Figure 2 – Geothermal power station of Bouillante.

Day 2 – BRGM and the "Observatoire Volcanologique et Sismologique de Guadeloupe"

The second day of the excursion was dedicated to two very important geological organisations of Guadeloupe: BRGM-Guadeloupe and the IPGP (Observatoire Volcanologique et Sismologique de Guadeloupe). The head manager of BRGM-Guadeloupe (France's leading public institution involved in the Earth Science field), Mr. Jean-Marc Mompelat, first described the administrative structure of this massive institution, followed by an overview of natural hazards in Guadeloupe. Afterwards, Mr. Jean-Bernard Dechabalier of "L'Observatoire Volcanologique et Sismologique de Guadeloupe", run by l'Institut de Physique du Globe de Paris (IPGP) gave a very detailed description of the various methods (seismology, dome deformation and geochemistry) used to monitor the La Soufrière volcano and possibly predict an eventual eruption.

Day 3 – La Soufrière

The day was devoted to hiking up La Soufrière. It was, without a doubt, the most anticipated day of the fieldtrip. Not only were the landscapes breathtaking (under a clear bright sky… it was actually the only day of the whole excursion where the top of La Soufrière was cloudless !), but the acid fumaroles towering over the La Soufrière dome were equally impressive, and hard to ignore both in sight and smell (Fig. 3). Moreover, the abundance of volcanic products, such as solid sulfur precipitation on the edges of degassing craters (Fig. 4), as well as the immense fractures cutting through the dome, generated much scientific discussion. In the afternoon, a few outcrops (Figs. 5-6) were visited, and demonstrated a very explosive volcanic activity (debris flows, lapilli tephra, ashfalls and hyaloclastites).

Figure 3 – Top of La Soufrière with acid fumaroles.

Figure 4 – Sulfur precipitation on the edges of degassing craters.

Day 4 – Grande-Terre's limestone

The following day was dedicated to the study of the limestone sequences in Grande-Terre. We were very grateful that Mr. Jean-Len Leticée, a stratigraphy specialist, agreed to guide us for this part of the fieldtrip (Fig. 7). He took us to type-locality (and spectacular!) outcrops, exposing the whole sequence of Grande-Terre's carbonate platform. The outcrop also provided prime examples of marine transgression and regression cycles. Spectacular coral-rich rocks (i.e., *Acropora* limestone; Fig. 8) satisfied many geologists' personal rock collection.

Figure 5 – Debis flows, lapilli tephra and and ashfalls deposits (from base to top).

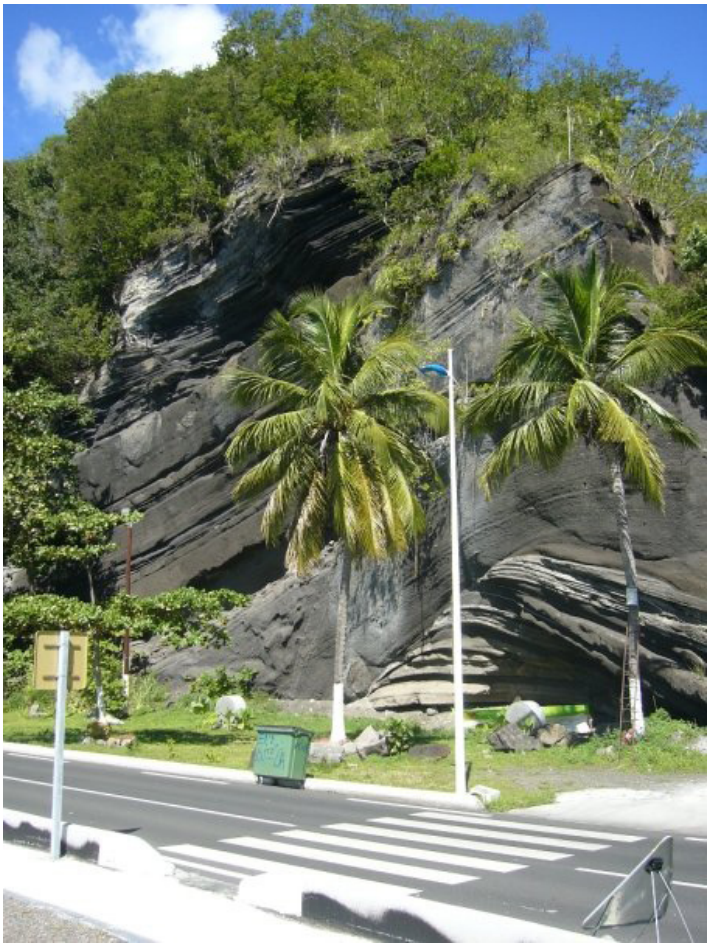


Figure 6 – Spectacular outcrop of hyaloclastites (Photo from Maude Lévesque-Michaud).

Figure 7 – Jean-Len showing us interesting tectonic features in the landscape (Photo from Marie-Hélène Fillion).

Figure 8 – Beautiful *Acropora* limestone (Photo from Jacinthe Légaré).

Day 5 – La Désirade Island

The visit to La Désirade Island was very much worthwhile, even if only for the tumultuous yet adventure-filled boat ride (although some of us were green-faced!) across this slice of Atlantic ocean. The first outcrop visited consisted of Jurassic pillowed basaltic lavas with interstitial radiolarite (Figs. 9-10). These lavas are interpreted to be either oceanic crust remnants and/or vestiges of an ancient volcanic arc. The pillows were quite impressive in size, up to a few meters, and very well preserved. In the same area, we had a look at some tempestitic rocks. It was interesting to see how sediments are affected by powerful Antillean storms. At the last stop the RGM hydrogeologist, Mrs. Amandine Dumont, gave us numerous pieces of information about water sources in Guadeloupe, problems related to source contamination, as well as problems related to the infiltration of sea-water into Grande-Terre aquifers. She also gave a brief overview of waste disposal problems in Guadeloupe, especially the lack of any recycling strategies on the island.

Figure 9 – Some of us looking at huge pillow lavas with interstitial radiolarite (Photo from Guillaume Lesage).

Figure 10 – Enormous epidote vein cutting through the pillows (Photo from Marie-Michèle Drolet).

Afterthoughts and conclusions

Although it is quite difficult to organize and guide a fieldtrip for 18 students with different geological backgrounds (2nd year bachelor to masters students), the excursion was a success. Of course we had some hitches along the way…We learned that it is far from easy to manage a five car convoy on busy roads and jammed roundabouts,

(respectful thanks to our friends the walkie-talkies!) but the group was cooperative and we had a lot of fun (Figs. 11-12). We are so pleased to have had the opportunity to learn AND see the geology and engineering issues of a 'young' active volcanic island. This will almost certainly be of use in our future courses or career. We are thankful to Mr. Réjean Hébert and Mr. Jacques Locat, professors at Université Laval, who accompanied us in Guadeloupe. We are also thankful to local specialists, for sharing their knowledge with us, as well as several companies and organizations which sponsored us; we are sure your investment helped us to be better geologists!

Figure 11 – Our group (Jean-François Montreuil, Jean-François Bélanger, Maxim Boisvert, Marie-Hélène Fillion, Joannie Poupart, Éric Marcil, Christine Bélanger, Jacinthe Légaré, Marie-Michèle Drolet, Pierre-Luc Fecteau, Pascal Bouchard, Maude Lévesque-Michaud, Julie Francoeur, Nicolas Déry, Rachel Bezard, Émilie Bédard, Guillaume Lesage and Michelle Deakin with our professors, Réjean Hébert and Jacques Locat) at the bottom of La Soufrière (Photo from Réjean Hébert).

Figure 12 – A typical creole supper (and beverage!) offered by our hosts (Photo from Maude Lévesque-Michaud).

2007 Volcanology and Igneous Petrology Division Financial Summary

Balance January 1, 2007	**4857.50**	
	Credits	**Debits**
Dues	698.00	
Publication sales	63.81	
Annual Business Meeeting , lunch		192.62
Newsletter		
Postage, Copying, Miscellaneous Office		28.45
Web page charges		15.85
VIP Award Medal Engraving		190.07
Bank Charges		5.37
Bank interest	10.53	
Totals	**772.34**	**432.36**
Balance December 31, 2007	**5197.48**	

2008 AWARDS

GÉLINAS MEDALS

Every year the Volcanology and Igneous Petrology Division of the Geological Association of Canada presents three medals for the most outstanding theses, written by Canadians or submitted to Canadian universities, which comprise material at least 50% related to volcanology and igneous petrology. A gold medal is awarded for the best Ph.D. thesis, a silver medal for the best M.Sc. thesis and an antique copper medal for the best B.Sc. thesis. Nominated theses are evaluated on the basis of originality, validity of concepts, organization and presentation of data, understanding of volcanology and petrology, and depth of research.

Gold medal - Yana Fedortchuk

This year's recipient of the Gelinas Gold Medal for the best Ph.D. thesis in Volcanology and Igneous Petrology is Yana Fedortchouk of the School of Earth and Ocean Sciences at the University of Victoria. Her thesis entitled "Emplacement conditions of some Lac de Gras kimberlites and their effect on the resorption of diamonds" is a blend of experimental and igneous petrology. She has provided some of the first quantitative estimates of intensive variables for kimberlite magma. Her work has shown the controls on diamond dissolution in kimberlites, and proven that kimberlite magma will only dissolve diamonds when it is fluid-saturated. She even unravelled how one could tell the composition of the fluid by the textures of the diamonds. Congratulations, Yana, on a first-rate job. The medal is well-deserved. - *Citation by Jarda Dostal*

Yana's response

Dear Members of the VIP Section, Geological Association of Canada,

I am honored today to receive the Gelinas Gold Medal for my Ph.D. dissertation. This award is very important for me as recognition of the significance of the research that I did working on my Ph.D. at University of Victoria. Working on this project was an incredibly interesting journey into the complex world of kimberlites and their interaction with diamonds. I feel very happy that I was able to find answers to some of the questions related to diamond oxidation in kimberlite magmas and, even more importantly for me, to formulate new questions that I hope to address in the closest future. I would like to acknowledge the incredible help and guidance of my Ph.D. advisor Dr. Dante Canil whose constant support and inspiration helped me to achieve this significant result. I am very sorry that I am not able to receive this award in person. The reason is that at present I am working on establishing my own experimental petrology laboratory at the Department of Earth Sciences at Dalhousie University and this is taking up a great deal of my time. I plan to take investigation of the processes of diamond interaction with kimberlitic and mantle fluids to new levels and I hope to be able to advance our understanding of the origin, emplacement and eruption mechanisms of these extremely interesting and complex magmas. I consider this award from Volcanology and Igneous Petrology Division of the Geological Association of Canada as an encouragement for the new and interesting work.

Dr. Yana Fedortchouk
Assistant Professor
Department of Earth Sciences
Dalhousie University, Halifax

Silver medal - *Not awarded in 2008*

Bronze medal - Kristy-Lee Beal

The 2008 Bronze Gelinas Medal for the best B.Sc thesis in Volcanology and Igneous Petrology goes to Kristy-Lee Beal of the Department of Geology at University of New Brunswick. Her thesis, supervised by David Lentz and Steve McCutcheon, is entitled "The Zealand Station Beryl (Aquamarine) Deposit, West-Central NB: Mineralogic,

Geochronologic, and Petrogenetic Constraints". This work investigates the potential for gem-qaulity beryls at the Zealand Station deposit whose mineralisation is related to the Pokiok Batholith. Through a comprehensive petrochemical and geochronolical study of the Hawkshaw and Allandale Granites and associated aplite-pegmatite dykes, Kristy showed that the mineralized aplite-pegmatite dykes were directly related to the last intrusive phase (Allandale Granite) of the Pokiok Batholith. Although there is little chance of an economic Be deposit, there is still good potential for gem stone pockets within the pegmatites. Kristy did a great job and most certainly deserves this medal. Congratulations, Kristy! - *Citation by Glyn Williams-Jones*

Kristy's response

I would like to thank the Volcanology and Igneous Petrology Division of the Geological Association of Canada for selecting my undergraduate thesis for the Léopold Gélinas Bronze medal; I am very honoured that my thesis received this distinction.

Completing an undergraduate thesis was a very rewarding experience. By working on a project, and turning it into something has encouraged me to continue academically to a master's thesis in a year. I would also like to give my sincere thanks to my supervisor at UNB, Dr. David Lentz, for his continual guidance and support.

CAREER ACHIEVEMENT AWARD

The Career Achievement Award is made by the Volcanology and Igneous Petrology Division of the Geological Association of Canada in recognition of career achievements in the field of volcanology and/or igneous petrology. Candidates will be judged on their lifetime scientific contribution

Citation for Sandra Barr

In recognition of her lifetime scientific contributions to the field of Volcanology and Igneous Petrology, I wish to nominate Dr. Sandra Barr for the Career Achievement Award of the Volcanology and Igneous Petrology Division of the Geological Association of Canada. I have known Dr. Barr for more than 25 years. Dr. Barr has published extensively in a wide variety of prestigious journals, on the national and international scene. For much of this time, her research has focused on petrogenesis of ancient igneous rocks such in the Appalachians and the Grenville, as well as the relatively modern mountains of eastern Asia as her natural laboratories. She focuses on fundamental problems, such as determining the relationship of their petrogenesis to the architecture of ancient mountain belts, and the mechanisms responsible for them. Although petrology may be her starting point, her approach is by necessity, multi-disciplinary. Dr. Barr has become a renowned expert in many fields, and, in addition to igneous petrology has employed mineralogy, geochemistry, geophysics, and isotopic fingerprinting of igneous, metamorphic and sedimentary rocks to understand these tectonic processes. However, her CV shows that this summary is an oversimplification. She has tackled important petrological process from local to regional in scale, and has studied rocks ranging from Archean to recent in age. Her contribution has earned her a thoroughly deserved first-class international reputation.

Dr. Barr's early papers focused on relatively young basaltic volcanic rocks in various parts of the Circum-Pacific, especially in Thailand (a region she continues to work in). Of particular importance is the foundation she laid for future studies of the Juan de Fuca Ridge. In the early 1980's, Dr. Barr began detailed field investigations (supplemented by sophisticated laboratory analyses) in Cape Breton Island, and by the mid 1980's she rapidly became a leading authority in the petrology of igneous rocks in the Appalachians and their relationship to tectonics. Through this work, she gained a well deserved national and international profile. By the end of a decade, her impressive body of work laid the foundation for a seminal paper (Barr and Raeside, 1989, published in the journal Geology) which provocatively proposed that Cape Breton preserved a complete cross-section of the Appalachian mountain belt, implying that an entire ocean had been consumed between the rocks of the northernmost and the southern Cape Breton Highlands. This paper, although not universally accepted, used a petrologic approach to turn the prevailing dogma of Appalachian tectonics on its head and focused the attention of geoscientists worldwide on this region. The paper stirred the mother of all debates, leading to an extremely successful 10- day field trip in 1992 with participants from all over the world studying the geology of Maritime Canada. Dr. Barr's international reputation was a big draw for this international gathering. During the 1990's, Dr. Barr sought ways to test the model outlined in this 1989 paper, producing, for example, the first Sm-Nd isotopic data for various igneous bodies within Cape Breton, a most innovative approach to tectonic analysis. As the data led her to firmer conclusions, she spread her wings to Labrador to study tectonic processes in much older igneous rocks. She is still as devoted

to field work as ever, and spends several months per year in remote areas obtaining the basic observations and selecting critical samples for laboratory testing. Most scientists would not work in the harsh, remote terrains of Labrador or even the Cape Breton Highlands, where the bugs are legendary. But Dr. Barr relishes and excels in these conditions! Coupled with her experience in the relatively recent tectonic events in Thailand, her studies in Labrador meant that she had become an expert in the changing relationships between igneous processes and mountain building for nearly half the length of geologic time. Her stature in the research community is indicated by continuous support from NSERC via Discovery Grants (and their predecessors) since 1976. Her grant was recently renewed for another five years, so her record of continuous NSERC funding is 35 years and counting.

Equally impressive in my view, is her "participaction" in the local, national and global geoscience community. I draw attention to a small sub-set off these activities. Within the local community, she has been one of the stalwarts of the Atlantic Geoscience Society, serving as its president, co-editor of its journal (Atlantic Geology, 1986-present), and has won its two most prestigious awards, the Gesner Medal for outstanding geoscience (1995) and the Distinguished Service Award (2006). On the national stage, over the past 25 years she has served as President of the Geological Association of Canada (2004), and in many other capacities in that organization and in the Geological Society of America. On the international stage, she has been devoted, for more than 20 years to the Association of Geoscientists for International Development (AGID), serving a term as its treasurer (1993-96), President of AGID-Canada, and is currently Vice President of AGID International. Her presidential address at the annual Geological Association of Canada meeting extolled the virtues of the role of geoscience in responsible, sustainable international development, and she published a most thought-provoking summary of that talk in Geoscience Canada in 2006.

Her footprint in the geoscience world is made even larger by her devotion to teaching and to her students. In this way, her contribution to igneous petrology will last a long time after she finally hangs up her field boots. She is renowned as an excellent, inspirational classroom teacher. She willingly teaches overload courses year-after-year, and has the same appetite for engaging students (undergraduate and graduate) in the wonderment of scientific discovery as she did on the first day she entered the classroom. She is even more influential outside the classroom, in one-on-one situations, in which she has infected her students with a zest for research and has given them the intellectual foundation and confidence to enable them to express their talents. Thus her immediate legacy, the intellectual development of her students at Acadia University, is immense. These students are now working in all corners of the globe and have learned first-hand about the science and its importance to society.

Sandra is a scientific leader and citizen of international stature. Her research has been innovative, with a level of sustained excellence for over 30 years. When she arrived at Acadia University in 1976, that institution was not known for its research. She certainly played her part in putting Acadia on the research map, in stimulating a research culture in the institution, involving undergraduate and graduate students in this research and providing the role model for younger professors in the science faculty. Today, she has the same zest for her chosen discipline as she had the day she got her Ph.D. The breadth and depth of her contributions spans some of the most fundamental concepts in the field of tectonics and she continues to serve as an inspiration to the modern crop of students in geology. She has excelled in research despite her very high level of commitment to her teaching and to the geoscience community at home and abroad.

Because we are both in the field of petrology and tectonics, our paths intersect often in the literature and at conferences. I am very familiar with her research, and its international impact. It is fair to say that in most articles, we are scientific adversaries, liberally expressing disagreement with each other's models. It has been a most enjoyable exchange of views and I have always had the utmost respect for her abilities as a scientist, and her contribution to her discipline both through her own work and the work of her students. In addition, she is an outstanding global "geocitizen", contributing immensely to her chosen profession on the national and international level.

I believe that she is thoroughly deserving of this honour. I believe it is time to formally recognize her lifetime contribution. She is a most deserving recipient of the Career Achievement Award of the Volcanology and Igneous Petrology Division of the Geological Association of Canada.
- Citation by Brendan Murphy

Sandra's response

I am very pleased and honoured to receive the Career Achievement Award from the Volcanology and Igneous Petrology Division of GAC. I think that I am much less of a volcanologist or igneous petrologist than others who have won this award in the past, so I feel quite humble in accepting it. Thank you to those involved in my nomination and selection.

My career has been very diverse and I am sure that many would agree that I am a "practitioner of many trades and a master of none", although igneous rocks have certainly been a focus throughout. I admit to having started graduate school at the University of British Columbia with the intent to do research in sedimentology, but I was seduced by the

then-emerging field of plate tectonics. I went to sea with Dick Chase, cruising back and forth over the northern end of Juan de Fuca Ridge, and ended up as a quasi-geophysicist, with a heavy dose of basalt petrology on the side. In fact, during my subsequent post-doctoral work in paleomagnetism at Dalhousie University a true igneous rock expert told me that my approach was that of a "weekend petrologist", and he was undoubtedly right.

Nonetheless, after teaching for two and a half years in Thailand and working on basalt, truly the only igneous rocks I knew anything about at that time, I was hired at Acadia University as an "igneous petrologist", although I quickly found out that teaching in a small department would include not only igneous petrology but also metamorphic, as well as optical mineralogy, geophysics, global tectonics, and earth history. In my second year at Acadia, I received funding from the Geological Survey of Canada and NSDNR to work on granites in Cape Breton Island. I recall Bill Poole saying that my background did not lead him to believe that I knew anything about granite. What saved me in the face of this very astute and accurate observation was a summer that I had spent working on the Saint George Batholith in southern New Brunswick with George Pajari when I was an undergraduate at UNB. I did not tell Bill that at the end of that summer I had firmly told George that I never wanted to work on granites again as long as I lived. Over the years George has been gracious enough not to remind me of that!

During the 1980's I think that I really was quite focused as a "granite petrologist" but then I became increasingly interested in tectonics and terranes, and what igneous rocks could tell us about them. So I evolved to once again being less of an igneous petrologist and more of a generalist. In recent years I have been co-author on papers on topics including stratigraphy, sediment provenance, paleontology, and geophysical modeling, as well as igneous petrology in both the narrow and broadest senses.

After I received my very first NSERC (then NRC) research grant, I was told by a member of the adjudication committee that in order to become successful in the longer term, I had to focus my research more, and give up the shotgun approach. I have to admit that I am glad that I did not take his advice! I feel that I have been incredibly fortunate in the diversity of what I have done. I have enjoyed collaborations with many fine people during my career, far too numerous to name, who have provided the U-Pb ages, the isotope data, the computer skills, and other expertise as needed. I am grateful to all of them. And most importantly, I have worked with many wonderful students, without whom I would certainly not be receiving this award. Thank you all.

Sandra Barr receiving her Career Achievement Award from VIP President Jarda Dostal

Meeting Announcements

33rd International Geological Congress

The 33rd International Geological Congress will take place in Oslo from August 6-14th, 2008. There are a number of sessions that may be of interest to VIP members, including:

EUR 02 Archean greenstone belts of Fennoscandia and beyond
GHZ-08 Volcano flank instability: Causes, precursors and associated hazards
HPP-02 Precambrian ophiolites and related rocks
HPP-03 The first billion years of crustal evolution
MPI-04 Mafic dyke swarms: A global perspective
MPI-06 Layered intrusions and the evolution of magma chambers
MPV-05 Volcanic eruptions: Chamber-, conduit-, and depositional processes and their implication for monitoring and hazard assessment