ASH FALL

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

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From the President

It is with sadness that I open this edition of Ashfall with news of the passing of a formidable volcanologist, and one of my predecessors as the Chair of the Volcanology and Igneous Petrology Division, Wulf Mueller. Dr. Mueller passed away on May 16, 2010 in Quebec City of pancreatic cancer.

As many of you know, Wulf has been a significant contributor to the fields of volcanology and Precambrian geology. In addition to being the chair of this division, Wulf distinguished himself as a North American editor of the journal of Precambrian Research, coeditor of several research books such as Precambrian Earth, Tempos and Events (Developments in Precambrian Geology 12, Elsevier Science), author of numerous research papers, field guides and reports, and supervisor of many graduate students. He was a field geologist par excellence. He organized and led many outstanding field trips. During his tenure at the Université du Québec à Chicoutimi, he was the recipient of many research grants which he used to provide opportunities for numerous students to do field work.

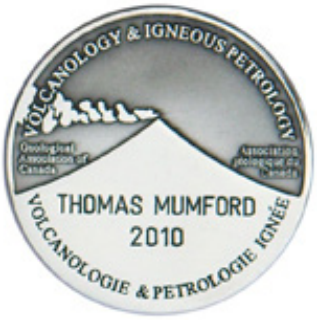
I met Wulf for the first time during an international volcanology trip to Italy organized by our division more than twenty years ago. Wulf impressed me not only with his enthusiasm, great knowledge of physical volcanology and willingness to share his wisdom, but also his passion and expertise regarding wine, cooking and European history. We spent hours during that trip and over the course of our friendship chatting enthusiastically about his other passions, soccer and hockey. His interests and enthusiasms were varied and fascinating. From the time of our first meeting in Italy, we became good friends and research collaborators.

The discipline of volcanology and Precambrian geology has lost an outstanding scholar with Wulf's passing. I am saddened by his death, not only because Wulf was an esteemed colleague, but also because I was privileged to have counted him as a close friend.

Wulf will be missed.

Jarda Dostal

The big news in volcanology for the last few months has been the eruption of Eyjafjallajokul volcano and the chaos caused by the ash. These photos were published on the National Geographic web site and were taken by Marco Fulle (right) and Peter Vancoillie (left)



2010 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 - Guillaume Girard

This year the Gelinas Gold Medal for the best Ph.D. thesis in Volcanology and Igneous Petrology goes to Guillaume Girard of McGill University (supervisor John Stix) for his thesis entitled "The dynamics of post-collapse magmatism at rhyolitic calderas: analogue experiments and geochemistry of Yellowstone lavas." This integrated investigation comprises experimental, field-based and petrological studies. In the first part of the thesis, Guillaume explores the dynamics of magma recharges using a series of analogue experiments. His results shows that when a magma is replenished by new material of similar composition, the new magma either ponds or rises rapidly in the reservoir. His experiments also show that buoyant new magma is able to efficiently open a pathway through the resident mush to the top of the reservoir. In the second part, Guillaume examines the rhyolites of Yellowstone caldera which erupted soon after the caldera-forming eruption at 639 ka. He inferred that the different rhyolites are not genetically related and invoked a model whereby a crystal mush is melted by replenishing silicic magma. The crystals which occur in these rhyolites are a mix of restites and newly formed crystals. In the third part, he examines the evolution of the youngest Yellowstone intracaldera rhyolites erupted between 173 and 70 ka. He concludes that these rhyolites were formed by partial melting of crystal mush at 250 ka. The conduits used for the eruptions were not ring fracture faults but instead large-scale tectonic fault structures which were re-activated and exploited after the caldera had formed.

The thesis is an important contribution to the understanding of the Yellowstone caldera in particular and silicic magmatism in general. The thesis has been published in the form of three papers in the international journals: Journal of Geophysical Research (114, B08203, doi:10.1029/2008JB005791; Buoyant replenishment in silicic magma reservoirs: Experimental approach and implications for magma dynamics, crystal mush remobilization, and eruption), Journal of Petrology (vol. 50, p. 2095-2125 - Magma recharge and crystal mush rejuvenation associated with early post-collapse Upper Basin Member rhyolites, Yellowstone Caldera, Wyoming), and Contributions to Mineralogy and Petrology (doi: 10.1007/s00410-009-0487-1; Rapid extraction of discrete magma batches from a large differentiating magma chamber: the Central Plateau Member rhyolites, Yellowstone Caldera, Wyoming). Congratulations, Guillaume, on a first-rate job. The medal is well-deserved - *Citation by Jarda Dostal*

Silver medal - Thomas Mumford

The 2010 Silver Gelinas Medal for the best M.Sc. thesis in Volcanology and Igneous Petrology goes to Thomas Mumford of the Geology Department, University of New Brunswick. The thesis was entitled "Dykes of the Moose Creek Valley, Ice River Alkaline Complex, southeastern BC" and was supervised by Drs. David Lentz and Cliff Shaw.

Thomas undertook a detailed and comprehensive study of the multiphase Ice River Alkaline Complex in the Main Ranges of the Rocky Mountains about 40 km east-southeast of Golden, BC. His detailed geochemical and isotopic study identified four distinct suites within the complex

and showed that at least some of the carbonatites within the Moose Creek Valley are temporally and magmatically isolated from the Ice River Alkaline complex. Thomas has submitted a number of abstract and extended abstracts and has a manuscript in review with Lithos. Congratulations Thomas - *Citation by Pete Hollings*

Thomas' response

I am very honoured to have been chosen for this award, and would like to take the opportunity to thank my co-supervisors Drs. Dave Lentz and Cliff Shaw, as well as Eagle Plains Resources Ltd. for their commitment to the project, and the support of my family and friends.

Bronze medal - Robert Cundari

The 2010 Bronze Gelinas Medal for the best B.Sc thesis in Volcanology and Igneous Petrology goes to Robert Cundari of the Geology Department, Lakehead University. His thesis, supervised by Professor Peter Hollings and Mark Smyk, is entitled "Geology and Geochemistry of the Devon Volcanics, South of Thunder Bay, Ontario". This work set out to clarify the origin of the "Rove Basalts", which had previously been mapped as both a volcanic and as an intrusive diabase sill. Robert undertook a detailed physical volcanological mapping program where he detailed a distinct chill margin with variolitic textures as well as evidence of pahoehoe textures and a glassy flow top margin. Not to leave it there, Robert went on to make a thorough geochemical study using major and trace elements to show that the unit ranged from tholeiitic to trachy-andesitic in composition. REE geochemistry showed a characteristic OIB signature with some crustal contamination while trace element characteristics imply an emplacement during the Keweenawan. Robert did a great job and most certainly deserves this medal. - *Citation by Glyn Williams Jones*

Rob's response

With heartfelt thanks, I express my gratitude to Dr. Pete Hollings and Mark Smyk for their enlightenment, as they guided me through this project. These two gentlemen were the inspiration that allowed me to develop and write my thesis. Receiving this medal is also a testament to the dedication and expertise of the Geology Department of Lakehead University. Without the backing and commitment of so many people this would have been a daunting task that would have been insurmountable. The standards of excellence of the VIP division of the Geological Association of Canada allow young, aspiring geologists to strive to advance their understanding and knowledge of volcanism and igneous petrology. I am truly honoured to be recognized by such a noteworthy institution as the GAC for my research and writing of the Geology and Geochemistry of the "Rove Basalts". Thank you for recognizing my work to be of a caliber that is worthy of this medal.

2009 Volcanology and Igneous Petrology Division Financial Summary

Balance January 1, 2009	**3363.39**	
	Credits	**Debits**
Dues*	1206.00	
Publication sales		
Support for shortcourse		
Annual Business Meeeting , lunch		
Newsletter		
Postage, Copying, Miscellaneous Office		
Web page charges		
VIP Award Medal Engraving		254.10
Profit from shortcourse		
Bank Charges		6.60
Bank interest	1.31	
Totals	**1207.31**	**260.70**
Balance December 31, 2009	**4310.00**	

*Note - dues for 2009 were not received until late January 2010 so are not included here

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 Kelly Russell

It is a distinct honor and privilege to introduce the recipient of the 2010 GAC Volcanology and Igneous Petrology division Career Achievement Award, James Kelly Russell. I have known Kelly since 1992, when he became my Ph.D. supervisor at UBC, and almost twenty years later we are still working closely together on collaborative research projects in British Columbia. I have found Kelly to be an inspiring and insightful mentor and collaborator, and he fully deserves to be recognized for his contributions to Canadian petrology and volcanology as well as his broader contributions to geoscience globally. His intellectual breadth, success in mentoring graduate students, and many contributions to Canadian petrology and volcanology set a high standard for modern igneous petrologists.

Unlike many people in modern science, who become very narrowly focused on a specific topic or analytical method, Kelly has always looked broadly to stay at the frontiers of petrology research and has had no fear of trying or inventing new theoretical or analytical techniques to advance his science. His intellectual breadth is immense. His contributions to 'hard core' petrology/volcanology include:

(1) helping to formulate (with collaborators in Germany) the highest quality numerical model to date for estimating the viscosities of silicate melts,
(2) becoming a leader in understanding the petrology and transport behaviour of kimberlites and constraining the chemical characteristics of primary kimberlite magmas,
(3) pushing the use of cutting edge thermodynamic models for studying the effects of crystallization, vesiculation and assimilation-associated mineral dissolution in magmatic systems,
(4) creating mass balance modeling software that accurately portrays not only solutions to mass balance problems but also rigorously quantifies the confidence envelops for the solutions,
(5) developing a model to predict the thermodynamic glass transition temperature,
(6) helping to establish Pearce Element Ratio analysis as a common tool for identifying and quantifying phases responsible for producing geochemical variation in magmatic systems,
(7) working to better understand the processes involved in welding of fragmental volcanic deposits, and
(8) introducing the use of Ground Penetrating Radar (GPR) into studies of fragmental volcanic rocks.

In many instances (e.g., GPR), Kelly has ventured into the realm of geophysics to 'borrow' techniques or methodologies to help solve petrological problems, and he is known in the global petrological community for his ability to quantitatively attack petrological problems at a mathematical level well beyond the abilities of most of his colleagues.

Kelly's intellectual breadth is also reflected in his mentoring relationships with students, starting in the classroom. He is an excellent classroom teacher who pushes students to gain new quantitative and analytical skills, and consistently works to make sure students go into the field to make observations, which frequently become the basis for class projects. He also has been an important part of UBC's field course. In the modern world of high tech equipment, Kelly keeps one foot firmly planted in field-based observational research, even while the other foot may be using Matlab to solve differential equations, or having students do laser ablation ICP-MS on mineral separates, or conducting experiments aimed at better understanding emplacement of lava domes. Strong mentoring of students has been a consistent characteristic of his career, and the success of many of Kelly's students has been broadly recognized by the VIP; over the past 15 years his undergraduate, M.Sc. and Ph.D. students have won at least seven Gelinas gold, silver or bronze awards. His former students have gone on to have successful careers in the geosciences, including working as college/university faculty, working for the Geological Survey of Canada, working for Geoscience BC, working for the BC Geological Survey, and working in the mineral resource industry. Many of his former students now hold roles in which they continue to contribute strongly to Canadian geoscience, establishing a legacy that will last beyond Kelly's active career (which we hope and suspect is far from over!). The success of his students is strongly connected to Kelly's ability to be a role model for students: he expects students to work at least as hard as he does, and those that do find success after they graduate from his laboratory. He works diligently to publish the results of his work (almost 150 total publications, >80 peer reviewed and counting) and strongly encourages his students to do the same, helping to establish work habits that benefit students throughout their careers.

Finally, Kelly has made many significant contributions specifically to Canadian petrology and volcanology, as was recognized in 2008 when he received the MAC Peacock Medal. With students and collaborators he has worked to better understand:

(1) the role of Cordilleran Mesozoic alkaline arc magmas in the production of economic mineral deposits,
(2) the formation history of the Coast Plutonic Complex,
(3) the volcanic history and potential future eruption hazards at Mount Meager,
(4) the volcanic history of Mount Cayley,
(5) the volcanic and petrologic history of Hoodoo Mountain volcano,
(6) the volcanic and petrological evolution of alkaline magmatism in the northern Cordilleran volcanic province and the Chilcotin Group,
(7) the petrological and thermal structure of the lithospheric crust and mantle beneath the northern Canadian Cordillera and the Slave Craton,
(8) the petrology and eruptive history of Slave kimberlites, and
(9) the dynamics of volcano-ice interactions throughout BC, from its southernmost volcanoes (Watts Point) to some of its northern most (Llangorse Mountain).

He has collaborated and published extensively with a wide range of research groups, including geoscientists at the GSC (C. Hickson, R.G. Anderson, G. Andrews, M. Kelman) and BCGS. He has also been a keen mentor to many younger geoscience faculty members and their students at UBC. His work has produced and/or promoted basic geological mapping, applied geophysics, mathematical modeling and a very strong foundation of physical chemistry.

Some of the most important petrologists/volcanologists in the world work or have worked in Canada, and a select number of them have received the Career Achievement Award from VIP. James K. Russell is well deserving of having his name added to this distinguished list.

Citation by Benjamin R. Edwards, Dickinson College

Kelly's response

I am honoured to be this year's recipient of the GAC VIP division's Career Achievement Award. When I first learned of my nomination for this award, I was surprised – and then I realized how good it felt to receive this recognition. Later, when Jarda Dostal phoned me to congratulate me on winning the award, I was deeply touched by his very kind words. I also am honoured by the fact that I have colleagues who feel that my accomplishments merited consideration for this award. And I am deeply appreciative to have my name included with those of the past recipients. To be added to a list of names that includes many of my Canadian scientific icons is absolutely magical.

I feel that prizes such as this Career Achievement Award are as much about the contributions of a person's colleagues as they are about the scientific successes of the selected individual. We all work hard to make contributions to our field, and we hope some of these contributions will be recognized as important. In addition, these awards depend on our colleagues; someone has to nominate you, organize letter writers, and drive the process, whilst others have to adjudicate the competition. In this regard, I am very fortunate to have a fabulous set of colleagues and friends. They form a part of what is a very generous scientific community. I would like to thank the people who made this happen: Jarda Dostal, Tark Hamilton, Ben Edwards, Cliff Shaw, John Stix, and Glyn Williams-Jones.

My career has been supported strongly by a host of mentors, colleagues, and friends. As an undergraduate in Earth Sciences at the University of Manitoba, I received a stellar, broad-based, undergraduate education and was introduced to volcanology by Lorne Ayres. I completed two graduate degrees at the University of Calgary, where I worked with Ed Ghent for an M.Sc. and Jim Nicholls for a Ph.D. These two scientists created a passion in me for the quantitative side of petrology and volcanology. And, during my dissertation, I also formed an important linkage and friendship with Tom Pearce of Queens University. After completing my Ph.D. in 1984, I was hired by the University of British Columbia during Hugh Greenwood's tenure as Head. It is at this university that I have continued to happily pursue research in volcanology and petrology. In addition, the field-based aspects of my research program have always been strongly supported by collaborations with Bob Anderson and Cathie Hickson at the Geological Survey of Canada. A large part of my success has resulted from the steady stream of young, bright, highly-motivated students and post-doctoral fellows moving through my lab. I especially want to acknowledge Ben Edwards, Steve Quane, Alison Rust, Mark Stasiuk, Genevieve Robert, Cliff Stanley, Maya Kopylova, Daniele Giordano, and Graham Andrews.

One of the most stimulating aspects of university research is our right to change our focus, goals, or methodologies. Over the last decade I have strayed into experimental volcanology, after being inspired by the work of Don Dingwell and his group at the University of Munich. This has fostered a tremendously exciting collaboration in the interdisciplinary field of Rock Mechanics of Volcanic Systems. Currently, this collaboration is between the experimental groups at UBC (myself and Lori Kennedy), Munich (Lavallee & Dingwell), and the University College of London (Phil Meredith).

I am pleased to say that the scientific issues arising from this area of research are guaranteed to keep my lab stimulated for years to come.

Thank you again for this honour.

Kelly Russell

MEMORIAL OF WULF U. MUELLER

May 27th, 1953 – May 16th, 2010

Patricia L. Corcoran and Edward H. Chown

Wulf Ulrich Mueller was born on May 27th, 1953 in Helmstadt, Germany. He was the middle child of three children. His father was a salesman for Volkswagen, which had him often travelling abroad, and resulted in the family's move to Toronto when Wulf was four years old and a later move to Montreal. The family returned to Germany when Wulf was 16. He attended boarding school near Heidelberg and served his mandatory training in the German army before beginning his undergraduate degree at Heidelberg University. In 1981, Wulf graduated with a Masters Degree of Mineralogy under the supervision of Dr. V. Stähle and Prof. Dr. G.C. Amstutz. His project concerned the petrography and shock metamorphism of granulitic gneisses from the Ries Crater. Wishing to trade on his Canadian upbringing, Wulf looked for a research topic in Canada for his PhD, and found a project in Archean sedimentology, a completely new field for him, jointly with Erich Dimroth of l'Université du Québec à Chicoutimi and G.C. Amstutz at Heidelberg. Following completion of this degree, he came to Chicoutimi first as a research associate and later as a full time professor. He continued his work on Archean successor basins across the Abitibi belt, Northwestern Ontario in the Superior Province and in the Slave Province. The superbly cleaned outcrops mapped in great detail that became his trademark were the foundation of this work which clarified many fundamental problems. At this period of his career he started to concern himself more and more with volcanology and combined with others to bring about compilations and tectonic models. Regardless of where he was listed in the authorship, he was the prime mover of these studies.

During the latter part of the 1990s, Wulf developed a heightened interest in volcanic processes, facies and their relation to ore deposits. He branched out from his early work concerning Archean terranes and began to study younger deposits in Namibia, Greenland and New Zealand. Wulf received funding from Kumba Resources Inc. to map an area 200km2 within the Neoproterozoic Schakalsberg Complex of the Sperrgebeit, Namibia. He and his Masters student determined the viability of other potential mine sites based on regional stratigraphic patterns coupled with detailed volcanic facies mapping. Two years later, Wulf returned to Namibia with a second Masters student to study the Koivib Mountains in order to elucidate the formation of the volcano-sedimentary sequence with respect to the break-up of Rodinia.

In 1996 Wulf worked with the Geological Survey of Denmark and Greenland to map and study a Paleoproterozoic volcano-sedimentary sequence at Kangerluluk, southeast Greenland. He determined that the volcanic and sedimentary facies were indicative of shallow-water Surtseyan-type eruptive activity. Deposits of this type had rarely been recognized in the rock record, and the project demonstrated Wulf's characteristic knack in applying modern eruption mechanisms to ancient deposits. Never one to be proven wrong, he attempted to gain a clearer understanding of modern volcanic products by participating in an ALVIN submersible dive to Seamount 6, and by examining Cenozoic volcanic edifices along the southeast coast of New Zealand with James White. Between field-related research endeavors, he made special time to lead numerous fieldtrips through the Abitibi belt, and teach his students field courses in far-away places like Hawaii, Arizona and the Canary Islands.

During the last decade Wulf continued to work on volcanic successions and their relation to volcanogenic massive sulfides (VMS). For this work, he was selected as a 2006-2007 distinguished speaker by the Canadian Institute of Mining, Metallurgy and Petroleum (CIM). He returned to the Abitibi belt and in doing so, helped redefine the evolution of Archean subaqueous calderas. Wulf clearly explained how and where VMS deposits form within caldera settings and at the same time proposed novel ideas concerning hydrothermal alteration patterns. His collaboration with the Ministère des Ressources Naturelles et de la Faune, structural geologist Real Daigneault from UQAC, geochronologist Jim Mortensen from the University of British Columbia, and geochemist Jarda Dostal from St. Mary's University, enabled Wulf to confirm his models for the evolution of the Abitibi greenstone belt. Much of his later work in the Abitibi belt concerned the formation of komatiite flow fields based on the physical volcanology

and geochemistry of Archean komatiites. In 2008-2009, Wulf took a sabbatical leave and conducted research at the University of Munich in Germany. During this time, he investigated hydroclastic fragmentation processes operative on seamounts and calderas.

Over the past 4 years, Wulf served as co-Editor-in-chief of the journal Precambrian Research, and throughout his life was a member of the American Geophysical Union, the Geological Society of America, the Geological Association of Canada (GAC), the International Association of Sedimentologists, the International Association of Volcanology and Chemistry of the Earth's Interior, CIM, the Global Precambrian Sedimentation Syndicate (GPSS) and the Geologische Vereinigung (Germany). Wulf was chair and vice-chair of the Volcanology and Igneous Petrology Division of GAC from 2001-2006. He has edited and co-edited numerous journal volumes, and co-edited the book Precambrian Earth: Tempos and Events. Over a span of 25 years, he wrote more than 90 peer-reviewed articles, reports, field guidebooks and short course notes.

Our personal experiences with Wulf were as animating as the man himself. Wulf is best characterized by the energy he exuded in all aspects of his life, whether stripping an outcrop, mapping it, or explaining it later to visitors or students. He had a certain exuberance when he taught in the open air, and that excitement also spilled over into playing sports and cooking. His enthusiasm was infectious and it would define him until his last days.

Wulf was a devoted father and loving partner and friend. A relationship with Sylvie Potvin produced a son, Andreas in 1994. Wulf later married Patricia Corcoran and in 2000 a second son was born, Owen. The last few years brought him together with partner, Christiane Bergeron-Leclerc who was by his side at the time of his passing. After being diagnosed with pancreatic cancer, Wulf remained strong and optimistic, even regularly working out at the gym. Closer to the end, he became accepting of the situation, but still joked and reviewed manuscripts from his bed. When he received messages from students and colleagues, Wulf was overwhelmed and surprised by the kind words written about him, words that spoke of his enthusiasm, passion for geology, generosity, cheerfulness, big personality, and invincibility. There is no one else like Wulf, and he will be sorely missed.

During the recent Institute on Lake Superior Geology meeting in International Falls, Minnesota, a field trip in the Mine Centre area of Ontario visited the North Rock Cu-Ni property being developed by metalCORP. The host rocks to the mineralisation are Archean mafic and ultramafic metavolcoanic rocks which included the unusual textures shown above. The photo on the left shows what has been interpreted as quench textures within a mafic flow, with large plagioclase crystals growing in from the edges. In the photo on the right pyroxene crystals are shown growing in from the plagioclase.