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FEATURE

THE TUCSON GEM AND MINERAL SHOW: A LEARNING OPPORTUNITY

BY JULIAN GRAY¹

For the first two weeks of February each year, Tucson, Arizona becomes the center of the mineralogical universe. It is estimated that more than 100,000 gem, mineral, and fossil collectors come to Tucson and that more than 2000 dealers set up there.

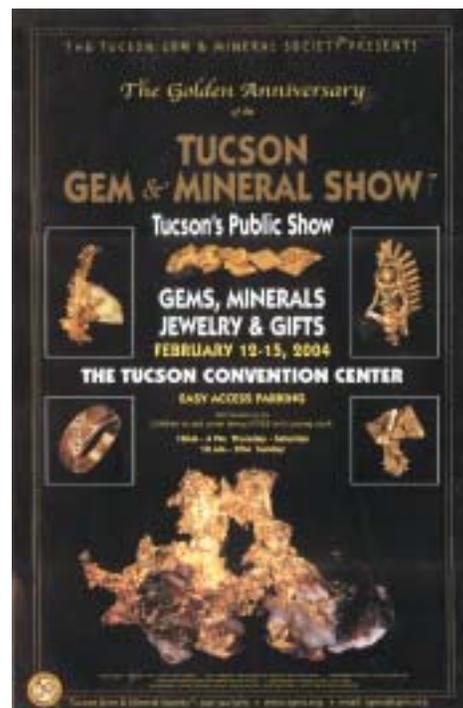


Dan Kile's collection of antique petrographic microscopes and universal stages on display at the main show. Dan has written *The History of the Petrographic Microscope*, which will be published soon in *Mineralogical Record*.

Mineralogists and mineral collectors from as far away as Australia, China, Russia, Germany, France, and South Africa gather in the city. In the process, they practically double the size of the town's population. I would like to share my observations and impressions of this year's show and try to demonstrate why all mineral enthusiasts should be in Tucson next year. In the coming months, you will doubtless see articles in *Mineralogical Record* and *Mineral News* about what's new in minerals, so I will not cover the minerals. Instead I want to give those who have never been to Tucson an idea of what the event is and why it is such a significant happening in the world of mineralogy.

Not Just One Show

First of all, Tucson is not a single gem and mineral show – this year there were thirty-four shows. The events that occur in February in Tucson began forty-nine years ago when the Tucson Gem and Mineral Society (TGMS) held its first gem and mineral show. The TGMS show lasts four days and is held at the Tucson Convention Center on the second weekend of February. Tucson veterans refer to this show as "The Main Show." As it began



The Tucson Gem and Mineral Show will celebrate its 50th anniversary in 2004.

to grow, other shows began popping up all over the city around the beginning of February. Most of these are held in hotels, converting the entire city into one large rock shop.

At the hotel shows, rooms become temporary rock shops as dealers set up glass cases over the furniture to display their wares and cover beds with cardboard flats of minerals. Several dealers who specialize in fluorescent minerals convert an entire room into a fluorescent mineral showcase by setting up ultraviolet lights and turning off the room lights. Hotel lobbies, meeting rooms,

Continued on page 4

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FROM THE NEWSLETTER EDITOR

Thanks to all of you who have sent words of appreciation, feedback, or suggestions. Knowing that you find the Newsletter interesting to read and useful makes my day. Once again, there is lots of interesting content, starting with a wonderful account of the Tucson Gem and Mineral show and the story of how a mineral collector became instrumental in the recovery of stolen moon rocks.

Newsletters on the Web

Newsletters 58 to 68 have been posted on our website as PDF files. If you are looking for Roger Mitchell's account of his expedition to Oldoinyo Lengai, or if you vaguely remember having read something on asbestos, you can easily obtain the information you seek by scanning the table of contents of each Newsletter, and printing the pages you need. And while on the website, do take a

minute to check it out. We keep adding to its contents.

In Case You Were Wondering

The color bands at the top of the last three Newsletters came from figures published in *The Canadian Mineralogist*. Of course, they have been lightened a lot for aesthetic purposes. Newsletter 66 showed a false-color back-scattered electron (BSE) image of laths of primary calcite (green), serpentinized olivine (blue), hydroxyl-apatite (yellow), and opaque phases (red to white) in a mesostasis of secondary calcite and serpentine, from an article by Chakmouradian & Mitchell (Can. Mineral. 37, 1179). Newsletter 67 showed a false-color BSE image of spherulites and discrete crystals of apatite-group minerals (purple to yellow) associated with acicular suolunite (green) from an article by Chakmouradian

et al. (Can. Mineral. 40, 128). Newsletter 68's banner displayed a mineral-distribution map, published by Togami *et al.* (Can. Mineral. 38, 1291).

Contest

And where did you see the band at the top of the current issue of the Newsletter? I will draw a name from those who send the right response. The winner will receive a MAC book of his or her choice. Send your entry to mac.amc1@sympatico.ca before August 15, 2003.

Rochester Mineralogical Symposium

In Newsletter 66, we published a report on the Rochester Mineralogical Symposium by Quintin Wight. This really sparked my desire to attend the event. I had the opportunity a few weeks ago to participate in the 30th symposium, in the midst of an ice storm. I enjoyed the breadth of talks and the fasci-

nating mix of researchers, mineral collectors, and dealers. I found the event a very worthwhile professional development activity.

Off to Japan

There is growing excitement in our household, as my younger son Thomas (17) and I are planning a 3-week trip to Japan, in June. Thomas is very interested in Japanese history and culture and has been learning Japanese for more than two years now. As I struggle to learn a few basic sentences, I can appreciate the extent of his accomplishment. As someone who had previously no interest in visiting Asia, I have become enthusiastic as I read more and more about this part of the world. Climbing Mount Fuji and hiking to Mount Aso, the largest caldera in the world, are on our agenda.

Pierrette Tremblay



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The Mineralogical Association of Canada was incorporated in 1955 to promote and advance the knowledge of mineralogy and the related disciplines of crystallography, petrology, geochemistry, and economic geology.

Any person engaged or interested in the fields of mineralogy, crystallography, petrology, geochemistry, and economic geology can become a member of the Mineralogical Association of Canada. Membership benefits include six issues a year of *The Canadian Mineralogist*, free access to the electronic version of the Journal, a 20% discount on publications of the Association and a discount on the registration fee at our annual meeting held jointly with the Geological Association of Canada.

Membership dues for 2003 are \$90. Membership dues for students and retired individuals are \$30 a year. Dues are in CDN\$ for Canadian memberships and in US\$ for memberships outside Canada.

Institutions and corporations may subscribe to *The Canadian Mineralogist* for US\$390 a year (outside Canada) or CDN\$390 (in Canada). Subscription includes site-license access to the electronic version at no additional cost to the institution. Institutions and corporations may also become a sustaining member of the Association for \$600 a year.

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Deadlines for the next Newsletters:

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EDITORIAL

ON A POTENTIAL MEETING SCHEDULE

BY NORMAN M. HALDEN, PRESIDENT
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You will recall that in previous Newsletters we discussed annual meetings. The schedule for the next few years is likely to look like this:

- 2003 Vancouver GAC-MAC-SEG
- 2004 Brock University at St. Catherines, ON GAC-MAC
- 2005 Halifax GAC-MAC, and 2005 Goldschmidt (Moscow, Idaho)
- 2006 Montreal GeoCanada-style meeting

Clearly 2005 is going to be an interesting year. The Mineralogical Association of Canada will be 50 years old in 2005 and we will want to celebrate by holding a special event at our annual meeting. I expect that we will be sponsoring some special sessions and preparing a special publication, for example. Discussions are ongoing at council, but we would also like to hear some ideas from you, our members. What would be a fitting way to celebrate our 50th anniversary?

In addition to the 50th anniversary celebration in Halifax, we are going to take an active part in the 2005 Goldschmidt meeting in Moscow, Idaho. Thus, the MAC logo will appear at two meetings in 2005. What this means is that the Technical Program Committee will be busy reviewing your recommendations for special session, symposium and short course sponsorships – yes, this is YOUR opportunity to put together a series of presentations on your science. You even have a choice of venues at which you can do this.

Plans are well underway for our second Berry Summer School to be held in Vancouver, from

September 1-5. It will be on silicate melts, will be given by Don Dingwell, and is being organized by Kelly Russell in Vancouver (see page 10 for additional information).

Currently, the Association is financially sound and we have some ability to promote meetings, short courses, and summer schools. We have received a number of ideas from Canadian members, but I remind our numerous international members that we welcome their ideas too.

Other things on the horizon include our participation in an initiative led by Rod Ewing to create an international magazine to "provide a means of shaping the image and activities of the mineralogical and geochemical disciplines. The magazine will provide a medium for interacting with the broader geoscience, material science and chemistry communities". A number of mineralogical societies have agreed to consider this proposal and MAC representatives are taking an active part in this discussion. I believe it is appropriate that we participate, as the magazine would likely be of considerable service to our membership. This may mean in the future we will see some of our Newsletter material in such a magazine.

So things are moving along nicely. *The Canadian Mineralogist* is increasingly recognized as a leading scientific journal. Our meetings are evolving rapidly to meet your needs. The Summer School initiative is an attractive new meeting format, particularly among students. With the new magazine proposal and the possibility of electronic journal aggregation in our future, the publication environment is changing, and we will be playing our part in this as well.

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THE FINEST NEW BOOKS!

LDVOZERO - by Dr. Igar Fel'ov - A comprehensive study of the history, geology and mineralogy of this prolific area of the Kola Peninsula, with nearly 500 pages and fully illustrated with hundreds of color and b/w photos, maps and drawings, plus comprehensive chemical and descriptive data on the 340+ mineral species that occur there! Hardcover volume, superbly done, just \$79.00 plus shipping. Exclusively from us!

LANGHAN - *The Mines, Minerals, Geology & Exploration* Ed. by Hultstrom and Langhof - A superb 215+ page hardcover book printed on exquisite heavy stock that tells the complete story of this prolific Swedish mineral locality. Filled with excellent color photos as well as black and white images of the rich mineralogy and history of this famous area, this book is a long-awaited masterpiece of regional mineralogy that every library should have! Full descriptive mineralogy of the hundreds of species that occur there, coupled with a marvelous historical treatment make this an instant classic! Large format (30x22cm), superb printing quality @ \$75.00 plus shipping.

THE BEST DATABASE! - NOW on CD!

The Ferguson Museum Mineral Database

This excellent software product is a comprehensive database of all approved mineral species through early 2000. Information for each mineral includes chemistry, mineral group, X-ray data and space group, optical data, other physical properties as well as type locality and literature references! Most importantly, every field or combination of fields is fully searchable! This DOS-based program works well in any Windows environment with an IBM-compatible system. We have prepared a full installation package and instruction guide for our clients, and this excellent software package is just \$69.00 plus \$5.00 shipping.

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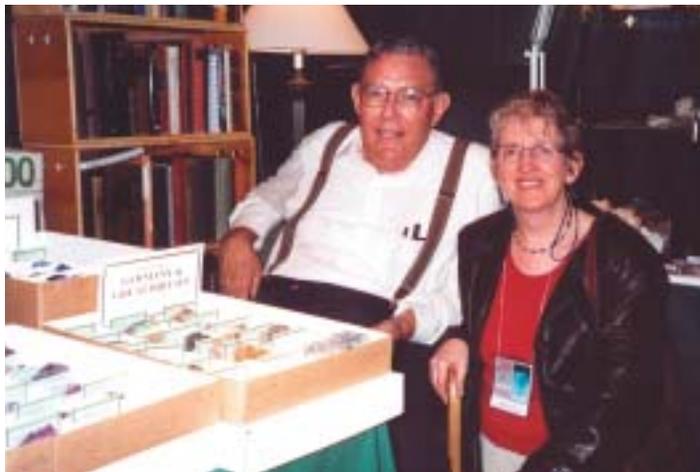
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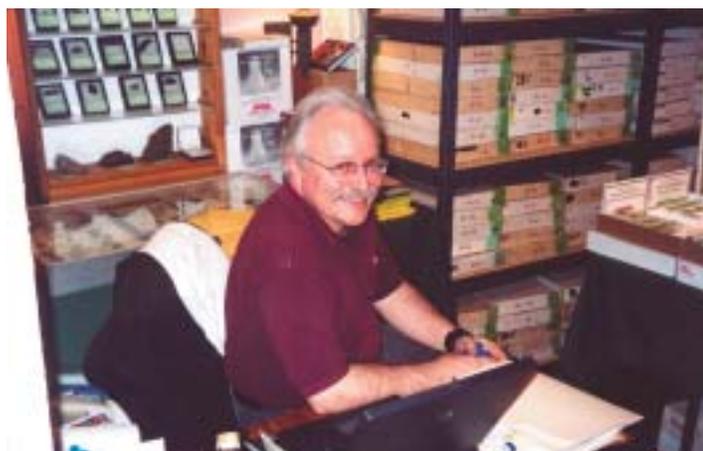
Continued from page 1

patios, and parking lots are crowded with dealers. When shopping, you simply walk into the hotel and wander down the halls. If a mineral dealer is doing business, the door to the room will be open and you just walk in and shop. Other shows take place in sports arenas and in tents on vacant lots. A free shuttle bus ferries people between the various locations.

The finest mineral dealers in the world exhibit at Tucson. Some specialize in single minerals or locations: gold, tourmaline, Russian minerals, and Indian zeolites, to mention just a few examples. This year I saw prices ranging from 50 cents to US\$90,000. Fortunately there were few specimens with a five figure or even four figure price tag – prices average less than US\$100. Amateur collectors,



Dick Bideaux, mineralogist and author of the *Handbook of Mineralogy*, and Pierrette Tremblay, MAC Coordinator, chat at the Excalibur Minerals room. Dick has just completed the fifth volume of the *Handbook of Mineralogy*. To find out when it will be available, check www.mineraldata.com



Tony Nikisher of Excalibur Minerals sets up shop at the Executive Inn show every year.

Something for Everyone

Minerals aren't the only things being sold in Tucson. Anything remotely connected with mineralogy, geology, the Earth, or Earth sciences is up for sale. In fact, there may actually be more gems and jewelry sold than minerals because of the large number of jewelry-only shows. Several shows also have a fossils-only theme. Some dealers specialize in books, mining artifacts, mining stock certificates, mineral art, gem-cutting equipment, microscopes, meteorites, micromounting supplies, and even mineral stamps. All the major magazines exhibit, some at several shows: *extraLapis English*, *Lapidary Journal*, *Matrix*, *Mineralogical Record*, *Rocks and Gems*, and *Rocks and Minerals*. If you buy too much to carry with you, no problem: one company sets up each year just to ship things for you.

museum curators, and wealthy mineral connoisseurs come to Tucson to shop. Many shoppers are mineral dealers themselves. Tucson is the place where they come to replenish their stocks and ensure that they have plenty of the fad mineral for the year.

Not Just Rock Shows – a Chance to Learn and Network

One of the main reasons that I go to Tucson as often as I can is because of the educational opportunities. Let's think about this for a minute. The major mineral dealers and collectors from around the world bring their best specimens to Tucson each year. It is a large, transient, natural history museum with mineral specimens of unparalleled beauty and scientific value. Many specimens are on display in educational cases at the main show. What a

chance to brush up on mineral recognition. What an opportunity to view the best examples of a given species.

Several professional organizations take advantage of the fact that there are so many world-renowned mineralogists in one place and hold their annual meetings in conjunction with the main show. A few of these are the Society of Mineral Museum Professionals (SMMP), the Friends of Mineralogy, the Fluorescent Mineral Society, and the Geoliterary Society. The SMMP and the Geoliterary Society hold short seminars. At the SMMP seminar on mineral repairs,

restoration, and fakes, Bryan Lees gave an excellent presentation on ways in which minerals that would otherwise be lost can be preserved or restored. For example, collectors frequently encounter collapsed mineral pockets with many single crystals that may have been a part of a single crystal cluster. Careful collecting and restoration in the lab can recreate the pocket, yielding valuable information on mineral paragenesis.

Most mineral collectors are familiar with the photography of Jeff Scovil. His incredible work is featured in almost every mineral and lapidary magazine and now



Crowds of people shopping for minerals, fossils, and gems in the arena area of the 2003 Tucson Gem and Mineral Show. This photograph shows only one third of the area of the main show at the Tucson Convention Center.

appears in many geology and mineralogy textbooks. Each year, Jeff gives a two-hour seminar on mineral photography, where he shares his hard-won techniques with everyone. It's worth attending the TGMS show just to see his work and hear the stories behind the specimens and photographs.

Another educational opportunity is the Arthur M. Roe Micromount Symposium. Several outstanding presentations were given this year and many well-known and knowledgeable micromineral collectors were present. Micromounters are the friendliest and most generous people involved in mineralogy. They selflessly share knowledge about locations, mineralogy, photography, mounting techniques, and equipment. They also enthusiastically encourage others by heaping free material for study on them, especially those new to micromounting. Attendees at this year's Arthur E. Roe Micromount Symposium brought hundreds of specimens for trade or gifts and covered seven tables with give-away material!

The major seminar occurs on Saturday and is sponsored by the Friends of Mineralogy. Each year the TGMS show has a theme mineral or region. This year's theme was Minerals of the Andes. Those attending the Friends of Mineralogy Symposium heard talks about collecting adventures from locations ranging from the bleak Atacama Desert to the spectacular Peruvian Andes. One of the most bizarre occurrences was described by Alfredo Petrov who discussed the strange minerals occurring in gypsum diapirs in Bolivia. Landslides and dissolution of the gypsum host rock expose the exotic minerals at this location. Then lush vegetation covers the exposures by the next year. A strange occurrence, indeed. Tony Kampf paid homage to the Bandy Collection at the Natural History Museum of Los Angeles where most of that collection now resides. Carl Francis discussed some of the more aesthetic and scientifically significant specimens from the Szenics Collection of the Harvard Mineralogical Museum. Carl was followed by Terry Szenics (szenicsite), who related his personal experiences acquiring the specimens that later ended up at Harvard! These were all excellent opportunities not only to learn about mineralogy, but to acquire first-hand knowledge about what is involved in finding, recovering, and studying these fine specimens.



Frank Hawthorne and Robert F. Martin at the banquet

Kudos: the Saturday Awards Banquet

One of the highlights of the Tucson show is the Saturday banquet. It begins with a silent auction to benefit the Geoliterary Society and the color fund of *Rocks and Minerals*. Following dinner, several awards are handed out. I enjoy this because the citation and acceptance speeches reveal much about the character of the people who have contributed the most to the field of mineralogy.

This year, Terry Wallace of the University of Arizona received the Carnegie Mineralogical Award presented by the Carnegie Museum of Natural History. Wallace was rewarded for his years of contributions to mineralogy through educational articles and lectures and through his efforts at the TGMS, where he served as its show chair many times. He also curates the Mineral Museum of the Department of Geosciences at the University of Arizona. Terry "is considered the foremost expert on silver and silver minerals in the United States." It is interesting to note that when Terry was looking for a permanent job after graduating from Caltech, he chose the University of Arizona largely because of the Tucson Gem and Mineral Show. In his closing remarks, Terry urged all mineralogists "to share their passion for minerals in a way they are best able. It can be as simple as mentoring a young collector or as complex as maintaining a mineral locality database on the Internet. Be involved – the future of the hobby is yours!"

Mark Feinglos of Duke University received the Mineralogical Association of Canada's Pinch Medal. Although the presentation of

the Pinch Medal is detailed elsewhere in this Newsletter, I would still like to share some of my own impressions. Pinch Medal citationist Frank Hawthorne reminded everyone that "mineralogy is one of the few disciplines in which the amateur can still contribute significantly to current scientific progress." Dr. Feinglos exemplifies that model. He is an endocrinologist who has collected minerals since the age of five. On visits to Rochester, New York, he met Bill Pinch, who inspired him to collect. "This [meeting with Bill Pinch] was a seminal moment for me. I saw what was possible for a private individual to do, given enough knowledge and seriousness of purpose." This close personal tie to Bill Pinch, another amateur mineralogist who has made significant contributions to the field, made being selected to receive the Pinch Medal a special honor for Mark. Mark then went on to contrast the fields of medicine and mineralogy. The former has become so highly specialized that it is no longer possible for the amateur to make contributions. He then thanked the Mineralogical Association of Canada for recognizing the efforts of the amateur.

Hearing these stories and motivational words made the trip memorable and worthwhile for me. All over the main show, contacts were established, information exchanged, collections enhanced by purchases. It is an amazing synergy, which takes place nowhere else in the world of mineralogy.

A Golden Opportunity to Learn and Network

Next year will mark the fiftieth anniversary of the TGMS show. The theme mineral? Gold, of course, for the golden anniversary. It is already shaping up to be a show of historic proportions. Bob Cook is already lining up fantastic speakers for the Friends of Mineralogy Symposium on Saturday. Bob Jones is writing a history of the TGMS, which will be published in the January-February 2004 issue of *Mineralogical Record*. I anticipate an amazing temporary museum of gold specimens, numerous talks on gold specimens and mining, and another fabulous show. The impressions and stories that I have noted here are not unique to this year's show. With this in mind and recalling that it will be the golden anniversary show, I suggest that you not miss next year's show! Book your hotel room early.

ASSOCIATION NEWS

PINCH MEDAL AWARDED TO DR. MARK N. FEINGLOS

On February 15, 2003, Dr. Mark N. Feinglos received the Pinch Medal of the Mineralogical Association of Canada. The medal was presented to Dr. Feinglos at the closing banquet of the Tucson Gem and Mineral Society, in Tucson, Arizona, in recognition of his dedication to mineralogy and substantial support of the professional mineralogy community.

Citation

Mineralogy is one of the few scientific disciplines in which amateurs can still contribute significantly to current scientific progress. Thousands of mineral collectors and mineral dealers worldwide collaborate with the scientific community to the great benefit of mineralogy as a whole. In order to recognize these contributions, the Mineralogical Association of Canada instituted the Pinch medal to be awarded biannually at the world's premier mineral show, the Tucson Gem and Mineral Show.

The second recipient of the Pinch medal is Dr. Mark N. Feinglos, Professor of Medicine at Duke University Medical Centre where he is Chief of the Endocrinology, Metabolism and Nutrition Division. Dr. Feinglos completed a B.Sc. degree at McGill University prior to pursuing a career in medicine. Despite the considerable demands of his career, Mark has focused much attention on his passion for mineralogy. He has established one of the premier private mineral collections in the world. Mark has both a keen eye and a keen appreciation for the scientific aspects of mineralogy, and has graciously made many superb



Dr. Mark N. Feinglos.

specimens available to mineralogists for study. Mark works with scientists at major U.S. museums such as Smithsonian and Harvard, universities such as Notre Dame, and government agencies such as the Geological Survey of Canada. Mark can recognize most species under the microscope, and has used this remarkable skill to identify species of unusual scientific interest. His appreciation for complex mineral associations has led to the discovery and/or description of six new species including paganoite, dukeite, and gallobeudantite. The mineral feinglosite, which Mark discovered, was named in 1997.

Mark is a fine amateur mineralogist who has focused on mineralogy because of his love for the subject. His dedication and substantial support of the professional mineralogical community make him an ideal recipient of the 2003 Pinch Medal.

Response

I want first of all to thank the members of the Mineralogical Association of Canada for this significant honor. You may be interested to know that this is the second award I have received from Canada related to geology. I

began collecting minerals almost 50 years ago to the day, when my aunt sent me a small collection for my 5th birthday. I vividly remember my mother's distress as I ignored all my other presents and focused exclusively on these treasures that completely captivated me. Shortly thereafter, my mother made the first of many trips with me from Syracuse to Rochester, NY to visit Ward's, where throughout my childhood, I would pester David Jensen. I had obtained volumes 1 and 2 of the seventh edition of Dana's System, and I wanted to see, and acquire, everything I read about. I will never forget the excitement of driving to what seemed my own personal grocery store of minerals, and poring over each of the many drawers to see what prizes were hiding there that I might be able to afford. In college, at McGill, I discovered the mineral collection at the Redpath Museum, furthering my mineralogical education there for eight years. While at McGill, I also received my first geology award, a scholarship from the Canadian Institute of Mining and Metallurgy. By the end of my junior year however, I had decided to pursue medical training. I thought that the interviewers would find the combination of mineralogy and medicine a little odd but, to my surprise, three of the five founders of the medical school at McGill had been seriously interested in mineralogy, as were many other physicians of the 18th and early 19th centuries. It was only much later that I realized that the skills one uses to develop a differential diagnosis of an unidentified disease from a set of observations are essentially the same as those used to recognize an unidentified mineral.

I pursued my interest in mineralogy throughout medical school

as best I could. Then in 1971, on a visit to Rochester, I first met my dear friend Bill Pinch. What was supposed to be a brief visit lasted most of the night. This was a seminal moment for me, for I saw what a private individual can do, given enough knowledge and seriousness of purpose. Bill actually wrote me a 2-page letter after my visit, talking about the visit and inviting me to return. At the time, I didn't realize how rare a substantial written communication from Bill is. Of course, in more than 30 years, I have never received another letter from him.

That first visit to Bill revitalized my interest in minerals, despite my time limitations, and mineralogy has remained my passion all these years. The reason that I find this medal such a particular honor is that, especially in my other life, I see myself as primarily a scientist. I have been fortunate enough to make some contributions to my field of medicine, which is endocrinology and metabolism. The concept that I might also be able to make a real scientific contribution to mineralogy grew from watching Bill as a model and from his continued encouragement over the years. Therefore, I accept with great pride this medal named in his honor.

I would like to thank the many good friends I have made in the professional and amateur mineralogy communities for their support and assistance through the years. I would particularly like to thank my wonderful children, Daniel and Becki, for patiently listening to me talk about minerals so often. I am especially appreciative of my daughter, who has been forced to accept substantial amounts of jewelry as a side effect of my mineralogical interests. How she has suffered! Finally, I would like to thank my

ASSOCIATION NEWS

late wife, Susan, who endured my collecting habits, including the hours spent in my mineral room and many less than desirable side trips on vacations, for many years without complaint. As a Canadian herself, she would have been particularly pleased with this medal.

The role of the individual, and particularly the amateur, in science has become increasingly constricted. The complexity of the expertise required to perform experiments and define observations has led to a significant increase in the number of collaborators required in all fields of scientific research. In medicine, the model exemplified by Dr. Banting, a general surgeon working in the community, and Dr. Best, then a medical student, discovering insulin at the University of Toronto in a laboratory borrowed for the summer to try an interesting project, has long since ceased to exist. Fortunately, in some of the physical sciences, there is still room for the collaboration of the professional and the serious amateur. In mineralogy, it is this collaboration that has led to the identification



From left to right, Frank Hawthorne, Mark Feinglos surrounded by his children Becki and Daniel, and Bill Pinch.

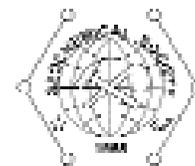
of a substantial percentage of the known minerals. I applaud the members of the Mineralogical Association of Canada for their recognition of the role of the non-profession-

al mineralogist, and personally look forward to many future collaborative efforts.

Thank you again for this honor.



New Publications from the Mineralogical Society of America and the Geochemical Society



There are two new publications in the *Reviews in Mineralogy and Geochemistry* (RiMG) series.

Volume 51 Plastic Deformation of Minerals and Rocks. 2002, Shun-ichiro Karato and Hans-Rudi Wenk, eds. 420 pp. Topics include new techniques of experimental studies for both large-strain shear deformation and ultrahigh pressures, deformation of crustal rocks and the upper mantle, interplay of partial melting and deformation, new results of ultrahigh pressure deformation of deep mantle minerals and microscopic mechanisms controlling the variation of deformation mechanisms with minerals in the deep mantle, stability of deformation under deep mantle conditions with special reference to phase transformations and their relationship to the origin of intermediate depth and deep-focus earthquakes, fracture mechanisms of ice, including the critical brittle-ductile transition that is relevant not only for glaciology, planetology and engineering, but for structural geology as well, experimental and theoretical studies on seismic wave attenuation, relationship between crystal preferred orientation and macroscopic anisotropy, illustrating it with case studies, recent progress in poly-crystal plasticity to model the development of anisotropic fabrics both at the microscopic and macroscopic scale, seismic anisotropy of the upper mantle covering the vast regions of geodynamic interests, using a global surface wave data set, and theoretical aspects of shear localization. generated by using both approaches in tandem. 550 pp. ISBN 0-93995063-4. Members US\$27; nonmembers US\$36.

Volume 52 Uranium-series Geochemistry, 2003, Bernard Bourdon, Gideon M. Henderson, Craig C. Lundstrom, and Simon P. Turner, eds. 656 pp. Exactly 100 years before the publication of this volume, the first paper which calculated the half-life for the newly discovered radioactive substance U-X (now called ²³⁴Th), was published. Now, in this volume, the editors Bernard Bourdon, Gideon Henderson, Craig Lundstrom and Simon Turner have integrated a group of contributors who update our knowledge of U-series geochemistry, offer an opportunity for non-specialists to understand its basic principles, and give us a view of the future of this active field of research. In this volume, for the first time, all the methods for determining the uranium and thorium decay chain nuclides in Earth materials are discussed. It was prepared in advance of a two-day short course (April 3-4, 2003) on U-series geochemistry, jointly sponsored by GS and MSA and presented in Nice, France prior to the joint EGS/AGU/EUG meeting in Nice. ISBN 0-93995064-2. Members US\$30; nonmembers US\$40

More information about these publications is available on the MSA website at www.minsocam.org or from MSA Business Office, 1015 Eighteenth Street NW Ste 601, Washington, DC 20036-5212, USA. ph: 202-775-4344 fax: 202-775-0018 e-mail: business@minsocam.org. You may also order these publications online.

FROM THE EXECUTIVE COORDINATOR

I became involved with the Québec Geoscience Centre in 1991, when I replaced the Assistant to the Director during her maternity leave. Afterwards, I stayed on for several years working on public outreach projects with researchers. It was therefore with much pleasure that I moved my MAC affairs from home to the spacious office that was graciously offered by INRS-ETE. As promised in the last Newsletter, here is a profile of the two partners making up the Québec Geoscience Centre, provided by its coordinator, Daniel Lebel.

PIERRETTE TREMBLAY

The Québec Geoscience Centre

The Québec Geoscience Centre (QGC) is a unique example of partnership between a university and a government organization. It includes professors from INRS-Eau, Terre et Environnement (INRS-ETE), one of four sectors of the Institut national de la recherche scientifique, and researchers from the Québec Division of the Geological Survey of Canada (GSC-Québec), under Natural Resources Canada. Both partners expect the QGC to be a



centre of convergence and excellence in geoscience and to foster synergy among governments, organizations, and universities in eastern Canada. Research activities at the QGC relate to important socio-economic issues and aim to increase knowledge related to regional geology (Appalachians, Grenville, and Quaternary), georesources (groundwater, minerals, and fossil fuels) and environmental geosciences (natural hazards, environmental geodynamics, characterization and restoration of contaminated sites, and climate change). Research activities benefit from state-of-the-art facilities in analytical geochemistry, stable isotope geochemistry, scanography, hydrogeology modeling, environmental characterization, dendrogeochemistry, *in situ* decontamination, and digital cartography and photogrammetry. Highlights of the 2001-2002 scientific program are presented in the QGC annual review, which can be downloaded at www.cgq-qgc.ca

The QGC team comprises about 120 people, including some forty professors-researchers firmly rooted in the scientific community of Québec and east-

ern Canada. Many members of the Centre support the activities of provincial, national, and international professional associations. Consequently, it was with great pleasure that QGC welcomed Pierrette Tremblay last spring, and we wish that the activities of the Mineralogical Association of Canada will find an appropriate environment in which to develop.

INRS-ETE, in conjunction with the Département de géologie et génie géologique at Université Laval, offers interuniversity programs of graduate studies in Earth sciences. The student community comprises 82 people. Students are registered at their

director's establishment and are trained at both INRS and Laval, thus widening the curriculum and choice of research projects. The QGC also hires postdoctoral fellows through the INRS postdoctoral program or the visiting fellowship program managed by NSERC.

As part of its ongoing commitment to promote public interest in the geosciences and contribute to the training of future geoscientists, the QGC produces outreach materials and organizes special events designed to raise the public's interest in science.

Daniel Lebel
Director, GSC-Québec
QGC coordinator

GSC-QUEBEC

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QGC website: <http://cgq-qgc.ca>



	Université du Québec Institut national de la recherche scientifique Eau, Terre et Environnement
	Ressources naturelles Canada
	Commission géologique du Canada
	Natural Resources Canada
	Geological Survey of Canada

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Québec Geoscience Centre**

PUBLICATIONS NEWS

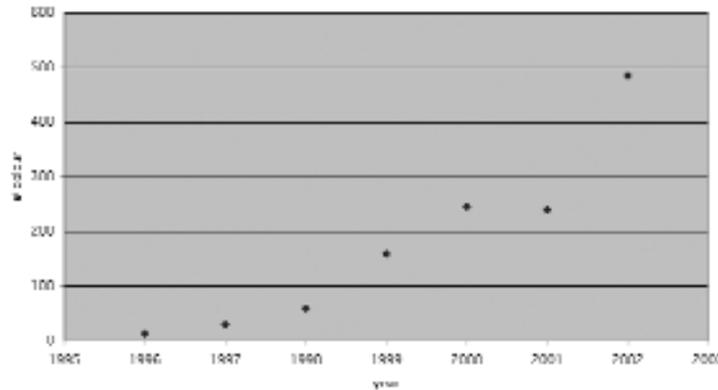
BY PIERRETTE TREMBLAY
PUBLICATIONS COORDINATOR

COLOR IN CAN MIN

I recently received the following e-mail from Doug Scott, compiler of our annual index.

Just a note... to send you an interesting factoid. As you know, I have been doing the index for years and when we started printing color photos I actually indexed the first few. That got too big by year three but I did not stop counting them and keeping a record of the numbers (see attached excel file). Bob and I are quite amazed that the resulting curve is STILL an almost perfect exponential by yearly total (r=0.97); however, if you just look at the last five years it is an almost equally perfect (r=0.94) straight line, as you will see. 2003 should be a very colorful year if the funding keeps up!

Indeed, in 1997, MAC instituted a policy of no charge to authors for color plates. Since then, the use of color has expanded greatly: in 2002, half of the articles published in *The Canadian Mineralogist* had at least one color plate. And in the first issue of 2003, all articles



Number of color illustrations over time

except two had color plates. The statistics presented by Doug have me somewhat worried, as I focus more on how much it costs MAC to publish so much color.

We are often asked how we can afford to publish in color at no cost to the author. Color costs now represent more than 20% of our printing costs. Fortunately, so far we have been able to take advantage of technological advances in printing, so that our standard printing costs have decreased and our overall printing cost per page has remained quite constant. But we have reached a point where we can no longer cut costs, and any increase in color will be reflected in increased printing costs.

Understanding printing

How much does it cost to print a figure in color? It depends on many factors. And it helps to understand a bit about the fascinating world of printing. Our Journal is printed on large sheets of paper, which are later folded and cut into 16-page booklets, and assembled with one 16-page booklet inserted into another. Each of these large sheets is called a printing form. Our color costs are based on the number of forms (front and back) that have color on them.

Here are what pages 33 to 64 of the February issue looked like, before they were folded and cut (*see figure below*).

Of course, if one page must be printed in color on any given form, the other 7 pages of the same form could also be printed in color at no extra cost. This is why you might see a color illustration that is not truly necessary.

Booklet 1

Form 1: Front

57 C	40 C	37	60
64	33	36	61 C

Form 1: Back

63 C	34	35	62
58	39 C	36	59

If it falls on a form that is scheduled for color, it will get published in color. One way we have been able to increase the number of color pages without additional cost has been by checking the layout just before we go to press in order to see where the color pages will fall. By studying the layout carefully, we can make small changes that save money. Often a color figure can be moved backward or forward one page. For example, for the above pages, in the original layout there was color on both forms, front and back. In order to decrease costs, Figure 4 of the Pilonen article was moved from page 39 to page 40; Figure 21 was moved from page 51 to page 52; Figure 2 of Sokolova's article was moved from page 63 to page 64. This decreased the color costs for these pages by half. Usually, 20 to 30% of our color costs can be saved in this way. If you are an author and the final layout of your article has been changed after you have seen the proofs, you will know why. From now on, I will try to make such changes earlier, as soon as the final pagination is known, in order to have the time to inform the authors.

An important concern has been what I see as an increase in the "aesthetic" use of color, and I have a question for you, our members: are you ready to pay a higher membership fee to see even more color?

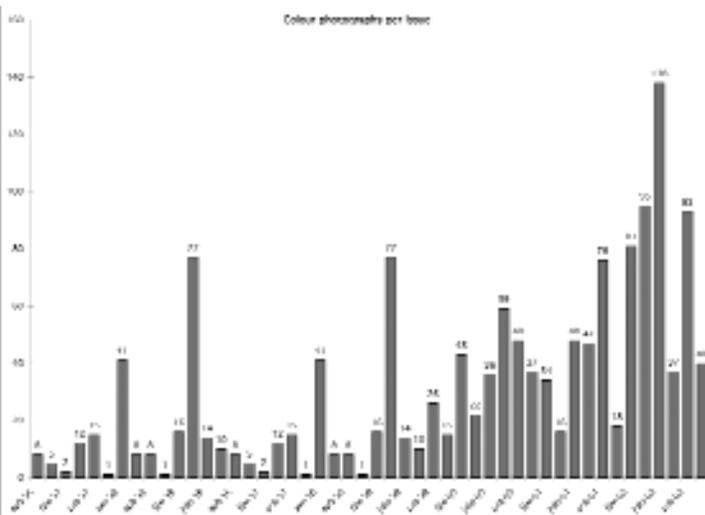
Booklet 2

Form 2: Front

49	48	45 C	52
56	41 C	44	53

Form 2: Back

55	42	43	54
50	47	46	51 C



Number of color illustrations per issue

STUDENTS' PAGE

2003 MAC Foundation Scholarship to Daniel Layton-Matthews

Daniel Layton-Matthews became interested in geology during the first year of his undergraduate degree at the University of Manitoba. During the subsequent four years, he became fascinated with ore deposits and chose to work on the alteration associated with the Mallery Lake epithermal system in the Northwest Territories for his B.Sc. Honours thesis. During his four years at the University of Manitoba, Daniel worked for the Manitoba Geological Survey, Phelps Dodge Corporation of Canada, and as a research assistant to Dr. A.C.L. Larocque.

In 1998, Daniel was privileged to meet Dr. C.M. Leshar from Laurentian University, who was on a Canadian lecture tour. As a result of this meeting, Daniel secured an M.Sc. position at Laurentian University, where he worked on the metasomatism of ultramafic intrusions in the Thompson Nickel Belt and the implications for mineral exploration.

In the course of his M.Sc., Daniel was awarded a NSERC post-graduate scholarship for Ph.D. studies at a Canadian university.

Again, through a lecture tour, Daniel was introduced to Dr. Steven D. Scott from the University of Toronto, with whom he is currently working. His research is a joint Geological Survey of Canada (Dr. J. Peter) and University of Toronto project on the Finlayson Lake area volcanic massive sulfide deposits in the Yukon Territory, Canada. During metallurgical studies of these deposits, it was

found that some deposits are extremely enriched in selenium, whereas others are not. Daniel's research proposes to explain the distribution of selenium within/among these deposits, and to identify the origin of selenium in the sulfide mineralization.

Daniel's Ph.D. research to date has included electron probe micro-analysis and synchrotron X-ray fluorescence micro-analysis of sulfide minerals. He has identified stoichiometric substitution of Se for S in the lattice of all major sulfide minerals (galena ~14 wt. %; sphalerite ~1100 ppm; pyrite ~100 ppm; chalcopyrite ~300 ppm). The distribution of Se within the sulfide mineralization is characterized by increased mineral and whole-rock abundances with increased proximity to the footwall of the deposit(s), where chalcopyrite mineralization is dominant. Empirically, this would suggest that the distribu-



Daniel sitting on the Teck Cominco Kudz Ze Kayah deposit in the Yukon, Canada

tion of Se within these deposits is closely related to areas of high-temperature hydrothermal discharge, which is in agreement with modern seafloor systems. Currently, a selenium stable iso-

tope study is being conducted by Daniel and will be the first attempt to apply $^{80}\text{Se}/^{76}\text{Se}$ ratios to "fingerprint" the source(s) of selenium in ore deposits.

Leonard G. Berry Summer School 2003 Workshop on Silicate Melts, Glasses & Magmas

Instructor: Professor Don Dingwell
Chair of Mineralogy and Petrology
Dept. of Earth & Environmental Sciences
University of Munich, Germany

Host & Convenor: Professor Kelly Russell
krussell@eos.ubc.ca
Dept. of Earth & Ocean Sciences
University of British Columbia
604-822-2703; Fax: 604-822-6088

Course: The Mineralogical Association of Canada is sponsoring the "Len Berry" summer school on Silicate Melts, Glasses and Magmas. This 5-day course is given regularly in Europe by Professor Don Dingwell and is offered in North America for the first time. The course explores the state of knowledge on the physical and chemical properties of synthetic and naturally-occurring silicate melts and glasses. The lectures cover basic theory, methods of experimental measurement, a review of melt and glass properties, and applications to physical volcanology. Specific topics include viscosity and rheology, density and equations of state, thermochemistry and thermal properties, electrical and optical properties, solubilities of volatiles, surface properties, strength and hardness, fragmentation.

Tentative Course Outline:

Monday: Basic theory on physical-chemical properties of silicate melts and glasses.

Tuesday: Experimental methods, review of melt properties, relationships between properties of melts and glasses and the behaviour of volcanic systems.

Wednesday: One-day volcanology field trip (2360 BP explosive volcanism at Mount Meager volcano, B.C.)

Thursday: Applications of "experimental volcanology":
a) geospeedometry based on calorimetric properties of natural glasses, **b)** predictive models for calorimetric glass transition temperature and melt viscosity, **c)** the rheology of crystal and bubble charged magmas, and **d)** fragmentation processes during explosive volcanism.

Friday: Material deformation experiments, & tours of labs at UBC.

Where: Dept. of Earth & Ocean Sciences
University of British Columbia, Vancouver, B.C.
[Contact: krussell@eos.ubc.ca]

When: September 1-5, 2003
UPDATES POSTED on <http://perseus.eos.ubc.ca/>

Registration Costs:

(Includes: lecture notes, coffee, & field trip costs)

Professionals: \$250 CDN (\$160 US)

Students: \$150 CDN (\$100 US)

* UBC offers economical short-term housing for workshop participants.

GEOBIZZ

BY DOLORES DURANT, PH. D.

Several months ago, I was hired by Natural Resources Canada, Canada Centre for Remote Sensing (CCRS) to work on the GeoConnections Discovery Portal Web site (geodiscover.cgdi.ca). How I got to here is a long story but here's a short version of it. I was hired to close down the crater database of the Geological Survey of Canada (GSC) for transfer to the University of New Brunswick. Whilst there, I met someone who needed a geologist with computer capabilities to work on the GSC portion of the GeoConnections Discovery Portal. The CCRS people liked my work and hired me to do the Geomatics Canada portion of the Discovery Portal. My job has been evolving and now also covers contract proposals and partnerships. It's not geology but that's fine because it's a great place to work. I've learned a lot and continue to learn: my insatiable curiosity is being fed and I'm happy.

One of the things that have been occupying me is languages. I've been working at retaining my old language of mineralogy (one of the many reasons why I continue to subscribe to MAC even though I don't do mineralogy anymore). I've also been working on learning two new languages. One is French and the other is what I suspect is called "business administration". Here are some of the new words that I've been learning in this new business language: peering, communities of practice, issues, outputs, outcomes, use case scenario, synergy, deliverables, action item, stakeholders, sunset programs, value-added, MOU, LOI, LOA (ok – I won't get

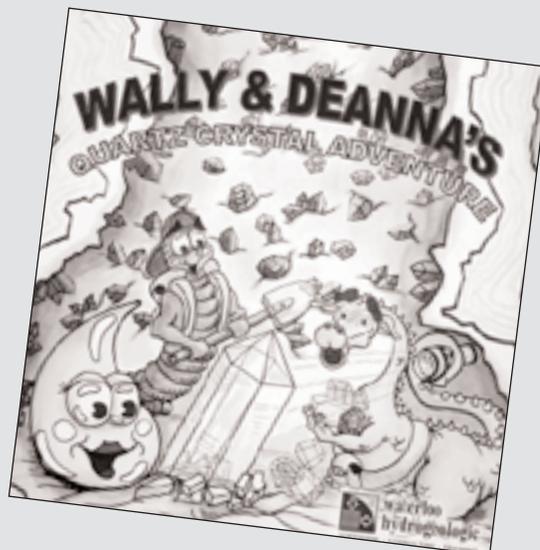
started on acronyms!). One of my favorites from this list is "synergy". It sounds so positive. I think it would be quite a compliment to be known as a synergist. I looked it up in the Merriam-Webster's on-line dictionary to see what it means – it's a chemistry term for "enhances the effectiveness of an active agent". I can see how it fits in so well with my new business language. I find it very interesting that two people can be speaking the same language and even using the same words, just in a different context. I'm also beginning to comprehend why people in business/politics and science don't always understand each other, especially when it comes to such important things as money.

Perhaps it should be required that undergraduate and graduate science students take a course in business so that the next generation is "bilingual". When I did my undergraduate degree in geology, I took all of my electives from geography, a course of action that I would now not recommend. There are too many other possibilities for a future career than just pure geology – something I didn't really understand at the time.

As for me, my current "action item" is to read a book on "communities of practice". It uses a lot of my new vocabulary and it gives me a chance to refine my understanding of my new language. So I hope that you've appreciated the writing of this "issue" within this columnar "output" in this fine "deliverable," the MAC Newsletter, in the hopes that it will produce, on your part, an edifying "outcome".

BOOK REVIEW BY PIERRETTE TREMBLAY

Wally & Deanna's Quartz Crystal Adventure



Educating the next generation about the importance of minerals is often cited as one step we can take to improve the standing of our science. Here is a concrete offering: a wonderfully illustrated children's book with a mineralogical theme to it, which was recently co-published by Edviro Enterprises Inc. and Waterloo Hydrogeologic Inc. *Wally and Deanna's Quartz Crystal Adventure* was written by Leanne Gelsthorpe and MAC member Peter Russell. Peter has had an interest in minerals and fossils from an early age and has devoted his life to educating children and adults about geology and the environment of planet Earth (see Newsletter 67, p. 19; Newsletter 61, p. 13), while Leanne has had a lifelong interest in the environmental sciences. The book is illustrated by Roger Fernandes, a graduate in Fine Arts from the University of Waterloo.

This 24-page book leads children through an illustrated journey in the "quartz" world. Starting from the initial formation of quartz to learning how quartz is used in many common household items, children will quickly understand why people say we live in the "Silicon Age." It would be appropriate for the first cycle of elementary school and would take advantage of the fascination of children for rocks and dinosaurs and their insatiable curiosity. It provides a large amount of factual information in a fun-to-read, interesting way.

The publication of this book was supported by a grant from the Canadian Geological Foundation. Wally and Deanna have already had a "Groundwater Adventure" and a "Wetland Adventure". The "Groundwater Adventure" was published in 1993 and has had an international career since: it was published in Portuguese for Brazil in 1998. The "Wetlands Adventure" was published in 2000 for the Wetlands Research Centre at the University of Waterloo.

Copies may be ordered from Waterloo Hydrogeologic Inc., 460 Phillip Street, Suite 101, Waterloo, ON N2L 5J2. Phone: (519) 746-1798, Fax: (519) 885-5262 or through the URL www.waterloohydrogeologic.com. The retail price of the book is US\$5.00/ CDN\$6.50 plus shipping costs. Quantity discounts are available.

FEATURE

FOR A PIECE OF THE MOON

BY AXEL EMMERMANN¹

A short-term decision about an innocuous e-mail message turned out to have really unforeseen consequences! Consider the case of Axel Emmermann, amateur mineralogist, of the Antwerp Mineral Club. His reaction had far-reaching consequences that are not over yet. On May 7, 2002, he opened the following message:

Greetings. My name is Orb Robinson, from Tampa, Florida. I have in my possession a rare multi-karat moon rock I am trying to find a buyer for. The laws surrounding this type of exchange are known, so I will be straightforward and nonchalant about wanting to find a private buyer. If you, or someone you know would be interested in such an exchange, please let me know. Thank you.

Orb Robinson

Axel immediately thought that someone was offering to sell him a piece of moonstone. The handling of moonstone is not regulated by any law, so Axel concluded that Orb was indeed referring to Apollo lunar samples! Realizing how tight security is when rocks from the Moon are displayed, Axel became suspicious. How could someone have access to lunar rocks? Rather than delete the message, as some fellow club-members had done, he wondered to himself whether others might be unaware of the illegal nature of the transaction. Or were they terrestrial rocks being peddled at an inflated price as lunar rocks, in which case someone might lose lots of money. Axel became convinced that something criminal might be going on. But what was he to do about it? Thus he obtained the e-mail address of the FBI's antifraud team, Tampa Division.

On May 14, he cautiously answered Orb. Axel said that he MIGHT be interested if the price was right and then only if Orb could authenticate the samples. Ten days later, without an answer from Orb, Axel communicated with the Tampa Division of the FBI. He ended his message by stating:

I seriously think that this person is trying to swindle unsuspecting people out of a lot of money. I have answered his mails indicating that I would be interested in a buy if the price was right. If you want, I can forward these mails to you. I realize that this probably is a low priority event but nevertheless I would like to report it.

By coincidence, Orb answered Axel the next day, saying:

Yes, valid proof will be provided. What is the approximate range of \$/gram that you consider "right"? Let's discuss your possible interest and see if we can make a great business partnership. If you are truly interested, then I will provide you with more detailed information.

Axel wrote back immediately and proposed a price of US\$800/gram for rocks under 10 grams and \$600/gram for larger specimens. Back came an answer the very next day:

Your prices are just fine; in fact I can do better than that for you, but I have minimum mass requirements. To give you an idea of my mass range I would prefer to stay around 1 kilogram. The following is the breakdown of the varying price range... \$500/g (0.5 – 0.64 kg), \$400/g (0.65 – 0.85 kg), \$300/g (0.86 – 1.5 kg). Of course, verification will be provided before you purchase. I think that if you are seriously interested, then we should meet and confirm this deal in person. Please let me know what you think. Sincerely,

Orb

It became clear to Axel that this guy meant business; at US\$300,000 per kilo, the rock samples had a high price, not within Axel's reach. He really felt like dropping the whole thing at that point, except that two days later, on May 27, he received his first communication from the FBI. Special agent Lawrence Wolfenden stated his interest in the case, but that he was not really familiar with the laws surrounding Orb's actions. SA Wolfenden assumed that the case was viable since Orb himself had already admitted that his actions were illegal. He wrote:

Last, if we do initiate an investigation into this matter, would you be willing to introduce an investigator to Robinson as your representative in the States? Since Robinson has contacted you already, your credibility with him must be sufficient to quell any concerns he may have in conducting an illegal transaction with a complete stranger. Again, thank you for your alerting the FBI to this matter.

SA Lawrence A. Wolfenden

Such involvement was not without risks, as Axel had signed his messages with his complete address and phone number. Orb already had all the necessary data to find him! On the other hand, the width of the Atlantic Ocean reduced the risk of retaliation somewhat. So, Axel decided to play along, and sent SA Wolfenden a suggestion for a reply to Robinson's last "price quote":

A real mineral collector (I'm not sure you have one of those on your team) would express at least some concern about the verification. Of course, if I really was so gullible as to believe Mr Robinson, I would be easily persuaded to buy if "my brother-in-law" was allowed to "take a look" at the rocks before buying.

He already dove under my suggested price per gram, but his "multi-carat" rocks have evolved to boulders of 1/2 kilo and more. This would be my reply if I was really an interested buyer:

"Hi Orb,

Your prices are better than I hoped for, but the specimens are quite large. You spoke of "multi-carat rocks" but a 500-gram rock would cost me \$250,000, and that is no small change. This amount is far out of my league, and I would have to find one or more financial partners. Are these really the smallest rocks you have? I would be more interested in smaller specimens. I could always split up a larger rock for resale, but it still is a large investment. Nevertheless, I can free \$85,000 on reasonably short notice. I would be happy to spend it on a single (authenticated) rock of at least 250 grams. I have, however, possible buyers for any dust or grit that came off those rocks. Have you any of that, and how much would you ask for it? Even minute amounts presented on black glass microscope-slides would possibly sell OK.

"I can't free myself from work right now, so a meeting in person would have to wait until September. However, my brother-in-law is an American, and he travels back and forth between the U.S. and Belgium quite often for his business. I trust him completely, and he also is a mineral collector. He might be able to verify the rocks' origin, I think. Would you be willing to deal with me through him? Sincerely..."

If you want to pursue this case, I am open to suggestions. The above text creates an opening for the introduction of an investigator, and is in line with

1. Original text by Axel Emmermann provided by Rik Dillen and edited by Robert F. Martin

the previous mail exchanges. Please let me know if you want me to send it or change it or send any other text drafted by you instead. Thank you for taking an interest in this matter. Sincerely,

Axel Emmermann

He then sent that message to the FBI, thereby irreversibly changing the lives of many, himself included. Orb's impatience grew, as he sent Axel the same e-mail over and over again, pressing him for a meeting and a swift closing of the deal. But Axel had to wait two more days for a reply from SA Wolfenden. Axel's proposal to create an "American brother-in-law" could work very well, he answered. He requested that Axel send him all the e-mail messages from "Robinson", or, as became obvious later, Roberts, his real name. The name "Orb Robinson" came about by transposing the name of the late Roy Orbison, Orb's favorite singer. Orb wrote:

If you are still worried that I am trying to sell you a fake, good, I don't want you to just take my word for it. Please let me address your voiced concerns. Just let me know what they are.... Acquiring this specimen is a sensitive matter for me as you can imagine, and that is why I have the minimum mass requirement. It is more a minimum financial barrier that makes this transaction worthwhile for me and my group.

For the first time, Roberts admitted that he was not acting alone. If he was intent on stealing and selling an American national treasure, he had to make sure to get enough money for it. He would, after all, be a fugitive for the rest of his life! That explains the "financial barrier". He clearly was going for the big money.

On May 30, Axel received an e-mail from SA Wolfenden:

I'll agree, Mr. Robinson is showing a little impatience; however, we needn't concern ourselves too much. He may WANT it (the money) sooner, but he'll certainly be willing to take it later. Let's make him conform to OUR timeline.

Later that same day, SA Wolfenden wrote that he found a female agent, SA Lynn Billings, to be Axel's sister-in-law, and he would pretend to be Axel's brother "Kurt". SA Wayne Nance was assigned to play the role of "Lynn" in the e-mail that was sent to Roberts. Thus brother-in-law became broth-



Axel Emmermann

er, and sister became sister-in-law, from Pennsylvania. Also the amount was upped a bit. Moreover, Axel's sister-in-law apparently was "somewhat of a hobbyist in mineral collecting" and, undoubtedly, she would be able to authenticate the rocks. If Roberts would agree to this, Axel was to give him the e-mail address of SA Lynn M. Billings. The poor villain would then unknowingly communicate directly with the FBI! So Axel sent the altered message to Orb on May 30, some three weeks after his first e-mail reply.

Axel received the reply from Orb the next day. He had become very nervous! Quite understandably so! The possession of moon rocks is a federal offence in the U.S. That is why he sought European buyers. But he was being forced to set up a meeting on U.S. soil. Moreover, by selling to an American, Orb Roberts risked running into a "buyer" with strong patriotic feelings. Greed, however, is an incredibly strong emotion! This man's e-mail brimmed over with suspicion and doubt to the point of being paranoid. He felt threatened because Axel "refused" to pay more than \$100,000. He wrote:

As you can see, this decreases my safety and increases my exposure and therefore I would only feel comfortable in doing this if I learned to trust you, which is difficult to do under the circumstances.

Roberts also claimed again that he had access to documentation about the rocks. Apparently, the moon rocks weren't in his possession yet, but he DID have access to them. He remained very vague about the nature of the documentation.

That message also was forwarded to the FBI. Roberts and Axel were allowed to simmer for four days. On June 4, SA Wolfenden sent Axel an e-mail in which he asked him to

send Roberts a message that he had drafted. The text contained the e-mail address of SA Lynn M. Billings, and the assurance that she was willing to make the transaction for Axel, but for \$100,000 only. This made Roberts very upset!

Axel heard nothing from SA Wolfenden until June 13:

It has been a few days. I hope things are still well with you. Things appear to be progressing here. I'll tell you more after things are resolved. What we would like to do at this time is have you send another e-mail to Robinson...

This e-mail told Roberts that Axel had wired \$100,000 to "Lynn" and "Kurt", and that they had confirmed receipt of the money. It also said that they believed that Mr. Roberts could be trusted and that his claims were truthful. Apparently, Roberts had made contact with the FBI agents via "Lynn's" e-mail address that Axel had provided. Later that day, Axel received a phone call from SA Nance. Apparently, there had been some concern about the possibility that Roberts might try to call Axel directly. Axel made the remark that he gradually became convinced that Roberts was for real and that he really was trying to sell authentic moon rocks. To his surprise, Special Agent Nance said that it was "not impossible". A few hours later came a follow-up e-mail message from SA Nance:

It was nice to talk to you this morning. I neglected to ask you for your help in putting together some questions that should be asked of Orb by Lynn. Since my knowledge of lunar materials is limited at best, I was hoping you could provide questions to ask Orb via e-mail that will lend to my or our credibility. Any help would be greatly appreciated. Sincerely,

Nick Nance

Axel was puzzled at first. There are plenty of specialists associated with NASA at the Johnson Space Center (JSC), so why would the FBI ask him for questions? But then it dawned on him... Apollo moon rocks are offered for sale, and as far as he knew, they were not even stolen yet. Someone with access to the Apollo collection must be trying to recruit buyers BEFORE stealing the rocks. Who might that be? JSC employees! In such a case, the FBI could not very well start asking employees there how one can distinguish between real, stolen moon rocks and fraudulently counterfeit ones. The last thing they wanted was to arouse the suspicion of "Orb

Robinson". Moreover, the FBI agents had no idea with whom Roberts was communicating besides Axel.

SA Patricia A. Koenig is with NASA's Office of the Inspector General. She was very valuable to the investigation and was able to obtain "inside" information. SA Nick Nance was able to trace Roberts' address on the messages sent to him; they came from the University of Utah (where Roberts was a student), from a public library in Houston, and from the Johnson Space Center (where he worked under a co-op program). Nance did not know whether Roberts was a teacher or student, but he knew it had to be someone affiliated with both institutions.

Axel applied himself to provide "Kurt" and "Lynn" with the pertinent questions to ask Roberts. They also needed to be able to recognize a real moon rock. How? Axel thought that they would be basaltic or breccia, with minerals possibly fused together as a result of large meteorite impacts. The basalt would be expected to contain minerals like pyroxene, olivine and feldspar, which should be recognizable with a hand lens. How does one give the average FBI agent a crash correspondence course in mineralogy?

Axel told SA Nance that there is an infallible way to tell moon rocks apart from any counterfeit "terrestrial" specimen: the presence of so-called "zap-pits". Because the moon has no atmosphere, ALL grains of sand and dust that rain down on it from space will hit the lunar surface with speeds somewhere between 10,000 and 80,000 km/hr. These particles approach earth also, but they burn up in the atmosphere because of frictional heat. Each pit has a surface of black glass and is surrounded by a white, shock-induced halo, a concentric zone of pulverized rock. A geologist's hand lens or small microscope would be all you need. The small pits can be counterfeited, but not the glazing of the impact zone or the shock-induced halo.

And then... there was silence. For precisely one month and one day, Axel heard nothing about the case. Not from "Orb" and not from the FBI. In one of the e-mails, an agent had mentioned that there would be a meeting with "Orb Robinson" at the end of July. Over this period, Axel found it very difficult to keep quiet, saying absolutely nothing about the case. The agents knew what was about to happen, but Axel remained in the dark, until... On June 15 he suddenly got a message from SA Nance. He was apparently preparing the



Recovered stolen lunar material

paperwork to issue a warrant for the arrest of Roberts. Nail-biting time!

On July 22 at 11:30 p.m., 4 months and 13 days after Roberts placed his ad on the club's web site and almost two months after Axel alerted the FBI, he received this e-mail:

FBI - Tampa Division

Mr. Emmermann:

What follows is the press release we put out today.

SA Lawrence A. Wolfenden, Tampa Div'n

Tampa, Florida

July 22, 2002 – NEWS RELEASE

Contact person: SA Sara Oats

On the 33rd anniversary of Neil Armstrong's historic walk on the moon, FBI Tampa and NASA-OIG recovered priceless lunar samples brought back to Earth by each of the Apollo missions that landed on the moon. The lunar samples were stolen on July 13, 2002, from the Johnson Space Center (JSC) in Houston, Texas.

James F. Jarboe, Special Agent in Charge, Federal Bureau of Investigation (FBI), Tampa Division, and Lance Carrington, Assistant Inspector General for Investigations, National Aeronautics and Space Administration (NASA) Office of the Inspector General (OIG) today announced the arrest, without incident, of three individuals, Thad Ryan Roberts, age 25; Tiffany Brooke Fowler, age 22; and Gordon Sean McWorter, age 26, who were taken into custody late Saturday in Orlando, Florida, by

Special Agents of the Federal Bureau of Investigation (FBI) and NASA-OIG and charged with Conspiracy to Commit Theft of Government Property and Transportation in Interstate Commerce of Stolen Property. A fourth individual, Shae Lynn Saur, age 19, was arrested in Houston and also charged with Conspiracy. Roberts, Fowler, and Saur were employees at Johnson Space Center.

Jarboe stated that since May 2002 an FBI undercover operation has utilized e-mail to communicate with an individual offering priceless moon rocks which he described as the world's largest private and verifiable Apollo rock collection. The e-mail messages were sent from several locations – the University of Utah, Johnson Space Center, and a public library in Houston. The continued exchanges included curatorial and historical records on the samples provided by the seller, and culminated in a meeting at a restaurant in Orlando over the weekend of July 20-21 to finalize the purchase of the Apollo moon rocks.

On July 15, 2002, a 600-pound safe containing lunar samples from every Apollo mission was discovered missing from the Johnson Space Center, and many of the samples listed in the inventory included those described for sale. Mr. Jarboe praised the joint investigative efforts of the National Aeronautics and Space Administration (NASA) Office of Inspector General (OIG) and the FBI in the swift recovery and arrest(s) in this matter. The Defendants arrested in Orlando were afforded their Initial Appearance before United States Magistrate Judge Thomas B. McCoun on July 22, 2002.

The FBI began this investigation after receiving a tip through an e-mail address established by the Tampa Division for Internet Fraud matters. The e-mail address is ifcc.tp@fbi.gov. Referrals of criminal matters to this e-mail box are handled by the BayNet CyberCrimes Task Force, a joint effort between the FBI Tampa Division, United States Secret Service, United States Customs, Florida Department of Law Enforcement, Hillsborough County Sheriff's Office, Tampa Police Department, and Federal and State Prosecutor's offices.

Axel then received a new message from SA Lawrence Wolfenden:

Dear Mr. Emmermann:

I'm writing to let you know that your assistance has been instrumental, in fact, essential, in recovering over 113 grams of lunar

samples from within a 600-pound safe stolen from NASA's Johnson Space Center last weekend.

"Orb" met with myself and a female agent in Orlando this weekend for the purposes of selling us \$100,000 worth of the samples. He had also hiked his prices considerably: a sample larger than a gram was to cost \$8,000 per gram. Instead, Orb and two companions were arrested. A search warrant for their hotel room was obtained, and the stolen samples were recovered. A fourth person, who had remained in Houston, was arrested on Sunday.

I'm attempting to obtain a copy of the Press Release which will be distributed to the media later today and will e-mail that to you for your information and, if you wish, publication in your newsletter. I'll also work on getting permission for the interview you requested. I certainly feel you deserve it; if you hadn't contacted us, I'm certain that Orb would have kept looking for a buyer for the moon rocks. Unfortunately, not everyone has your integrity. Someone would have taken him up on his offer and what can certainly be considered a "National Treasure" would have been lost to the U.S. Government, possibly forever.

The samples Orb tried to sell us were genuine Apollo mission samples. The stolen material included samples from every mission that successfully landed on the moon. Also in the safe stolen by Orb and his co-conspirators was the ALH84001 meteorite (Background info here: <http://www.jpl.nasa.gov/snc/nas a1.html>). We recovered it also, along with a number of scientific journals, notebooks, and other materials which had been in the safe.

This should be hitting the evening news here tonight (typically 6pm, EDT), but may be car-

ried on some of the news channels before then. We've been receiving a lot of inquiries, some from international news agencies. We've said nothing concerning your involvement other than that the investigation originated with an e-mail tip. It's not my place to bring your name into this; if you want to, then you are free to do so. I will note, however, that "Orb" will certainly be able to figure out that it was you contacting us that got us involved. (Unless he believes you were an undercover FBI agent as well. At this point, he may even wonder if you are real. He was certainly confused and somewhat disoriented after learning that I was not Dutch. He evidently has never made acquaintance with any Vlaaming or Nederlanders because what I used was not a very good accent, and the only Dutch I can say easily and without hesitation is "Heel goed. Jou sprekt ein klein beting Nederlanj." Please excuse the poor spelling. I was working only on speaking Dutch. My plan was to respond to any comments by Orb in Dutch with "Very good. You speak a little Dutch, but my wife does not, and prefers I not hold private conversations in front of her.")

I've rambled for long enough. I'll get you a copy of our press release as soon as possible.

Again, thank you. This has caused quite a stir, and has been very exciting. It has been a pleasure to work with you. Your thoughts and ideas were a crucial aspect of making this a success.

Your brother,

"Kurt"

*SA Lawrence A. Wolfenden,
Tampa Div'n*

Following those two e-mail messages, a flurry of activity ensued in the media. Axel Emmermann and club officials found themselves in the thick of

it. Axel found out only later about the details.

SA Nance played the "on line" role of Axel's sister-in-law Lynn. He wrote e-mail messages to Roberts in her name. SA Lawrence Wolfenden and SA Lynn Billings played the roles of Axel's brother Kurt and his wife Lynn. They arranged the meeting with "Orb Robinson" and his friends in Orlando, after which they drove to the hotel where the moon rocks were kept and the arrests were made. In the restaurant where the meeting was set up, the manager and all personnel had been replaced by Special

Agents. Also there were SA Koenig, together with three other special agents: SA Scott B. Cheney, SA Michael C. Brady and SA Sara Oates. The agents innocently had to ask Roberts and his accomplices in a very friendly way what he would like to drink... or pretend that they were busy with bills and customers while watching the safety of their colleagues and possible bystanders. The operation was completely successful, thanks to a well-briefed and enterprising group of Special Agents and, to a large extent, to Axel Emmermann's decision to get involved, purely out of a sense of civic duty.

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PEOPLE BEHIND MINERAL NAMES

GERHARD TISCHENDORF

The mineral *tischendorfite*, $\text{Pd}_8\text{Hg}_3\text{Se}_9$, associated with christianite, tiemannite, stibiopalladinite, and clausenthalite, was named by Stanley *et al.* (2002) after Gerhard Tischendorf, eminent mineralogist and geochemist long affiliated with the Zentrales Geologisches Institut in Berlin, part of the Ministry of Geology of the former German Democratic Republic (GDR). In the mid-1980s, he joined the Zentralinstitut für Physik der Erde of the Academy of Sciences of the GDR in Berlin/Potsdam. In the year leading to his retirement in 1993, he worked at the GeoForschungsZentrum Potsdam, Germany.

Gerhard was born in 1927 in Treuen (Vogtland), near the Erzgebirge Mountains, southeastern Germany, an area with a well-established history of mining. His interest in nature was nurtured by his grandparents, and reinforced in his formal education in Auerbach and Dresden, interrupted by a stint in the Nazi army. After WWII, he was deported as a prisoner of war to the Donetz basin area (Ukraine), where he spent two years mining coal underground. This experience consolidated his interest in mining and rocks. After his return to Germany, he enrolled at the Bergakademie (Mining Academy) in Freiberg. Gerhard was there from 1949 to 1953, first in mining technology, but after two years, in mineralogy. Two of his teachers, Friedrich Leutwein and Oscar Walter Oelsner, taught him that minerals are not "dead" objects, but the result of geological processes.

For his dissertation, Gerhard first investigated vein-type barite-fluorite-bearing Pb-Zn deposits. However, he developed a major interest in the genesis of selenide deposits. He found that a high activity of oxygen in the ore-forming hydrothermal solutions is of



critical importance for the deposition of Se minerals. Selenium thus is kept from substituting for S in sulfides, and can form selenides. In the telethermal Se occurrences in the Harz Mountains (Tilkerode, Zorge, Lerbach), he showed that most of the elements fixed in selenium minerals were mobilized from the carbon-rich schist constituting the country rock of the veins. His research culminated in an integrated genetic model for this type of Se mineralization. The roles of fugacities of oxygen, water, and sulfur in fluids and their pH formed essential subjects of research. Subsequent studies of Se minerals from Tilkerode led to investigations of eskebornite and stibiopalladinite. His studies of the geochemistry of selenium finally merged into a Habilitation thesis, in which he discussed the partitioning of Se in S minerals of different origin. One sees how appropriate is the naming of *tischendorfite*, a selenide from Tilkerode first documented by Dr. Tischendorf in his doctoral studies.

During his work at the Zentrales Geologisches Institut in Berlin, Gerhard focused on the exploration of tin and tungsten deposits in the Variscan Erzgebirge metallogenic province. Special emphasis was devoted to the genetic relationship between such mineralization and highly fractionated, specialized granites. This topic was "in" in the 1960s, especially among Russian ore geologists, who believed that the search for hidden resources

could be optimized if their location and morphology on the one hand, and the mineralogy and the geochemistry of ore-generating granites on the other, were well known. One highlight of this work was the international cooperation within the IGCP project on "Metalization associated with acid magmatism" headed by Miroslav Štemprok (Prague), Lucien Burnol (Paris), and Tischendorf between 1971 and 1979. Several publications concerning the metallogenesis of tin and the geochemistry of specialized granites ensued.

Between 1968 and 1978, Gerhard Tischendorf acted as the president of the National Committee of Geological Sciences of the GDR, which coordinated all East-German non-government activities within the International Union of Geological Sciences (IUGS). Between 1975 and 1977, he sat on the Board of the International Geological Correlation Programme (IGCP). For his manifold activities for the International Association of the Genesis of Ore Deposits (IAGOD), he was offered an honorary membership in 1993. Between 1963 and 1989, he served as a visiting lecturer for "Spezielle Geochemie und Metallogenie" at the Mining Academy in Freiberg.

Studies on the metallogenesis of the Erzgebirge and on the geochemistry and mineralogy of the granites have continued to be a focus of Gerhard's activity. Over the years, he developed a special interest in the geochemistry and classification of trioctahedral micas, and in their enrichment in trace elements and in their use as monitors of tectonic conditions during emplacement and of petrochemical evolution of the granites that contain them.

Gerhard Tischendorf has always had a great passion for history and philosophy, and for the development of society as a logical consequence of his life expe-

riences. He is ideally placed to discuss the best model for modern society. After his retirement, he wrote his memoirs, which he made public to an interested readership in 1999. He also is fond of collecting aphorisms. Currently, he is active in a local mineralogy club in Zittau (Saxony), where he shares the wealth of his experience. Another of his passions is the photography of the many churches around his new surroundings in the Zittau Mountains near Oberlausitz, close to the Polish and Czech borders.

I thank Hans-Jürgen Förster for providing me with the information contained in this profile.

Robert F. Martin

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OBITUARY

GUY PERRAULT (1927–2002)

BY ROBERT F. MARTIN

The Mineralogical Association of Canada lost one of its earliest members, Guy Perrault, on January 11, 2002. Born in Amos, in the Abitibi region of Quebec, Guy held degrees from École Polytechnique de Montréal (B.Sc.A.) and the University of Toronto (M.Sc.A., Ph.D.). At the Master's level, he worked in the field of stratigraphy and sedimentation, but changed orientation for his Ph.D. He tackled a meaty subject, the geology of the western margin of the Labrador Trough, under the supervision of Walter W. Moorhouse. In the third part of his thesis, he dealt with the silicate minerals of the iron formations, and developed a need to learn the fine points of X-ray diffraction, under the supervision of Edward W. Nuffield. One sees early on, therefore, burgeoning interests in crystallography, mineralogy, petrography, and ore deposits, themes that would recur during his long career.

He graduated in 1955 and started his teaching career at École Polytechnique, his *alma mater*, the next year; he retired with the title *Professeur émérite* in 1990. As he rose through the ranks, Guy's level of activity in the area of mineral exploration made him a valued member of the Department of Geological Engineering, whose mission statement involves teaching and research in the applied aspects of our field. He served as chairman of the department from 1966 to 1972, and took the helm again in 1974 and 1975. He was a founding member of the Association des Professeurs de l'École Polytechnique, and served as its first president (1963–1965). Over the span of his career, he served as thesis advisor to 24 students, two of them at the D.Sc.A. level. His first M.Sc.A. student worked on pyrochlore at Oka and graduated in 1962, whereas his last student worked on gold mineralization in the Abitibi and graduated in 1989.

Throughout his career, he maintained close ties with companies active in mineral exploration, for example, St. Lawrence Columbian & Metals, active in exploiting the Oka carbonatite complex, and SOQUEM, where he served as Vice-President (1975–1977) in charge of research and international activities. He was also a moving force in establishing the *Institut de Recherche en*



Guy Perrault on his graduation day in 2001, as Bachelor of Music.

Exploration Minérale (IREM/MERI), and served as its president in 1980–1981 and director general in 1981–1983.

In addition to his activities in mineral exploration, Guy developed a real interest in the exotic minerals that occur in the Montereian igneous complexes, in particular at Mont Saint-Hilaire and Oka. He gave his first oral presentation on this theme at the ninth annual GAC–MAC meeting in 1964 (Boissonnault & Perrault 1964), and justifiably focused on sérandite from Mont Saint-Hilaire; the previous summer, a young Frank Melanson (now of Hawthorneden Minerals) had brought in several “unknowns” to Guy, and the identification of sérandite, the Mn-dominant analogue of pectolite, must have been a source of great excitement. Although not first discovered at Mont Saint-Hilaire, that is where the world's best crystals of sérandite are found. Guy thus was among the first to underscore the importance of this locality as one of the world's premier mineralogical sites. He coauthored the first compilation of minerals found there (Chao *et al.* 1967); among the 85 or so minerals documented in the compilation, 53 had been recognized in Guy's laboratory at the École Polytechnique. There followed a flurry of activity in mineralogy and structural crystallography, in which he defined three new mineral species, lemoynite (1969), yofortierite (1975), and steacyite (1982), and established the structure of ekanite (1972),

nenadkevichite (1973), weloganite (1975), and lemoynite (1976). After this period of exhilaration with quantitative and very challenging aspects of mineralogy, he returned to geochemical themes of research, largely focused on gold and the Abitibi camp, but also including the geochemistry of niobium.

Guy served as president of the MAC in 1967–1968, and in his Presidential Address, he dealt with *La Minéralogie de nos jours à l'an 2000* (Perrault 1970). It is fascinating to read about his vision of the mineralogical sciences in 2000. He foresaw major advances in the field of lattice dynamics and, ultimately, in the link between structures and thermodynamic properties of minerals, as well as in the areas of crystal chemistry and crystal physics. Furthermore, he anticipated likely applications of these breakthroughs to the rational exploitation of our mineral resources. His predictions turned out to be very accurate indeed. Another trend, which he found rather distressing, as it was already evident to him, concerned the diminishing number of people engaged in research on minerals in their broadest sense, and the decreasing impact of the Earth sciences compared to other fields of scientific endeavor.

On one of his last meetings as a member of the Finance Committee of the MAC, and one of my first, I remember Guy harping on the theme that the MAC had to learn to pay its way! He was saying that we had to be much more aggressive in generating funds internally, and less dependent on handouts. In those days, we had nothing to sell except the journal, and even that was not being marketed aggressively. He also served the MAC as Associate Editor (1979–1982). He was awarded the Berry Medal of the MAC in 1989 in recognition of his exceptional services to the Association (*Can. Mineral.* **27**, 727). He was elected a fellow of the Royal Society of Canada in 1973 and was awarded the Queen's Silver Jubilee Medal in 1977. In 1991, one of his early collaborators on the mineralogy of Mont Saint-Hilaire, George Y. Chao, gave the name *perraultite* to a hydrous Na–K–Ba–Mn–Ti–Nb silicate discovered in pegmatite dikes in the nepheline syenite at Mont Saint-Hilaire. Yamnova *et al.* reported the structure of perraultite in 1998, and Pekov *et al.* (2000) provided more refined information; both used crystals of perraultite from a Russian locality.

OBITUARY

Guy had other talents. He was an excellent speaker, and incorporated humorous anecdotes in his lectures. He had a jovial disposition. He had lots of class, with his own ideas on how to do things properly. A few weeks after he graduated from the University of Toronto with his Ph.D., he invited all members of staff and their spouses to dinner at a fine restaurant in Toronto, as his guests! And he brought along his parents to meet the staff. Guy thus left an indelible mark among geologists at the U of T, as no one had shown (or has shown since) his gratitude to his professors in such a way. He was also generous in serving others, and was genuine in wishing that each person be able to achieve his or her aspirations.

Guy was initiated to the piano through private lessons from age 6. From that point until the end of his undergraduate program, he continued his involvement with piano, then trombone. In classical music, he was especially attracted to the compositions for piano by Chopin, Mozart, and Beethoven. Music had remained very much on a back burner throughout his career in the Earth sciences. Upon retirement, however, he achieved one of his dreams, that of becoming a fully accomplished pianist. The professor switched roles, and Guy started anew as a student: he enrolled as an undergraduate in the Faculty of Music at the Université de Montréal, and obtained his B.Mus. in 2001. He was a courageous, ambitious, and creative individual, a man of action, who will continue to inspire those of us who knew him!

On behalf of MAC members, I offer condolences to his wife, Hélène, and his daughters, Marie, Sylvie, and Isabelle. I acknowledge the help of Marie Perrault, Marc Tanguay, and Edward W. Nuffield in preparing this obituary.

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Professor **Takashi Miyano** of the Institute of Geosciences, the University of Tsukuba, Japan, passed away on October 21, 2002. Our sincere condolences to his family and his colleagues.

CLIFFORD FRONDEL (1907-2002)

BY CARL A. FRANCIS¹

Clifford Frondel, prominent descriptive mineralogist, died peacefully in Winchester, Massachusetts on November 12, 2002 at age 95. Frondel was born in New York City and grew up on Long Island. He earned a degree in geological engineering from the Colorado School of Mines in 1929, a Master's degree from Columbia University in 1936, and a Ph.D. from Massachusetts Institute of Technology in 1939, under Martin J. Burger.

Fron del became a research associate of Harvard Professor Charles Palache who was engaged in the monumental revision of *Dana's System of Mineralogy*. Frondel was a prodigious worker who described 48 new species in the course of his long career. His extensive bibliography demonstrates the remarkably wide breadth of his interests, necessitated in part by his "Dana" work. The seventh edition of *The System of Mineralogy* appeared in three volumes in 1944, 1951, and 1962. Although the junior author, Frondel wrote most of volume II and all of volume III by himself!

Fron del served as a civilian Senior Physicist in the Signal Corps of the War Department and Director of Research at Reeves Sound Laboratories in New York during World War II providing technical assistance for the quartz oscillator-plate industry. Quartz became a favorite subject, to which he returned with the silica volume of *The System of Mineralogy* and in his final research papers on chalcidony and agates.

Fron del was appointed to the Harvard faculty in 1946 and retired in 1977. He published more than a dozen papers on uranium mineralogy. This research program culminated in the publication of U.S. Geological Survey Bulletin 1064, *Systematic Mineralogy of Uranium and Thorium*, a 400-page

volume that is the basis of our modern understanding of radioactive minerals.

Fron del and coworkers notably advanced our understanding of Franklin, New Jersey mineralogy, especially of poorly crystallized minerals such as the manganese oxides and the unglamorous rock-forming silicates. His book *The Minerals of Franklin and Sterling Hill - A Checklist*, published in 1972, is a benchmark in the study of that extraordinary mineral deposit.

In addition to his teaching of undergraduate and graduate students, Frondel served as Curator of Harvard's Mineralogical Museum for 32 years. He enriched the museum's collections enormously. The A.C. Burrage bequest, with its fabulous gold specimens and beautiful Bisbee azurites and malachites, was his most notable acquisition. However, most of his purchases of individual specimens and entire collections were clearly intended to support research. His most important museological legacy is the strong tradition of using the Harvard mineral collection for scientific research, even to the extent of sacrificing rare and valuable specimens to destructive analysis.

Fron del received many honors during his long life, notably the Becke Medal from the Austrian Mineralogical Society and the Roebling Medal from the Mineralogical Society of America. He is one of very few for whom two mineral species have been named! Frondelite, the manganese analogue of rockbridgeite, named in 1949 by U.S. Geological Survey colleague Marie Lindberg, recognizes his studies of pegmatite phosphates, while cliffordite, a uranium telluride, was named in 1969 by former graduate student Richard Gaines, in recognition of his studies of uranium mineralogy. His achievements have been an inspiration to many.

1. Harvard Mineralogical Museum, Cambridge, Massachusetts 02138, francis@eps.harvard.edu

MEMBER IN THE NEWS

DORIAN SMITH AND MINIDENT

Dorian Smith, long-time member of MAC and Berry Medalist for distinguished services to the Association, is poised to release a new version of MinIdent – the culmination of 20 years of work. The Newsletter has asked him to tell us the story behind this comprehensive database. You can also read a review of it in the April issue of *The Canadian Mineralogist* (p. 548)



Dorian Smith

Basically, there were five different possibilities: It was a previously known mineral, which might appear in one of several different texts such as Dana's 7th edition; it could be a compositional variant not previously reported of such a mineral; or perhaps a recently described mineral that had appeared somewhere in the now very substantial international mineralogical literature. Alternatively it might be a previously described but so far unnamed mineral, buried somewhere in that same literature, or, just possibly, it was actually a new mineral.

More than a third of a century ago when I came to Edmonton as a young petrologist with distinct mineralogical leanings, I was placed in charge of the procurement and development of an electron microprobe. This was, at the time, a rather new instrument that promised to revolutionize our understanding of rocks, ores, and their constituent minerals in much the same way as the introduction of the optical microscope had done in the previous century. Developments in instrumentation came at a frenetic pace in those early years with the introduction of computerized matrix corrections, miniaturization, and automation of instruments, followed by solid-state X-ray detectors and energy-dispersive spectrometers. Some overlap quickly developed with the SEM. One side effect of all this for me was that substantial numbers of staff and students began to use the instrument—and in quite diverse areas of academic endeavour. Inevitably, many previously unnoticed minerals came to light, and I came almost to dread that tap on the door between the 'probe lab and my office that presaged the question: "I've got this analysis of a mineral that I don't quite recognize.... I wonder if you have any idea what it might be?" Often I hadn't – and hunting through texts and journals could be very time-consuming and even take days.

By the late seventies, I had come to the conclusion that the only way I could deal with these daily challenges to my mineralogical expertise, was to establish a computer database that contained the composition of all named and unnamed minerals. I was able to interest in this project a very bright young man, David Leibovitz, who was about to enter the Computing Sciences program at the University of Alberta. He became part of a small team, along with students such as Heida Omoumi, Chuck Mah, Rob Pinckston, and Maurice Macagno, whose main task was to enter data scavenged from the literature. In those days, only a mainframe computer could cope with such a massive project and for a couple of years we worked to design and code the program

that we christened "MinIdent" – obviously, we thought, short for mineral identification. The unexpected capital "I" that appears in the middle of the name was added to discourage a widespread preference for a pronunciation that suggested a small tooth!

Like many projects, after conception MinIdent grew like the renowned Topsy. At first I had thought that useful compositions of most if not all minerals might be calculated from their idealized formulae. It soon became clear, however, that this approach was inadequate and that it was necessary to record real data from actual samples. And then, if we were accumulating all this compositional data, why not take the opportunity to include other data—powder diffraction lines, optical parameters in transmitted and reflected light, cell dimensions, and various additional physical properties such as hardness and density? Notwithstanding the compilation of vast amounts of data, it eventually became apparent to us that, unless any data for an unknown corresponded very closely indeed to the data in the database, matches would be rarely achieved. This led to one of the most important features of the software, the implementation of scoring algorithms that would attempt to determine by the calculation of a matching index (goodness-of-fit index), how similar an unknown was to each of the minerals in the database. The twenty best fits were then presented to the user. For these algorithms to work well, we needed to store along with the compilation of the raw data, measures of the variability of the parameters in natural samples.

This approach to the identification of minerals was, at the time, quite revolutionary and led to an article on it being published

in *The Canadian Mineralogist* (Smith & Leibovitz, 1986, **24**, 695-708). Also during the 1980s, the desktop computer started to come into its own and the mainframe version of MinIdent was ported to a desktop DOS platform, when it became "MinIdent-PC". Thereafter, of course, it could soon be run successfully on a laptop. Data were added steadily but in the mid-1990s the limits of the original custom-designed database were reached and it gradually became "stale". David Leibovitz had moved elsewhere on to bigger and better things. The product might well have languished and eventually died had it not been for the drive, abilities, and enthusiasm of Professor Michael Higgins from the University of Québec at Chicoutimi. Michael had cut his computing teeth on the knotty problems of numerical modelling of size distributions and determining crystal morphologies on the basis of bulk measurements on thin sections. He embarked upon the complete re-coding of the MinIdent software for Windows™ platforms, utilizing the Delphi™ database product, commercially available from Borland®. At the same time, a massive update of the database was undertaken.

All databases have a strong probability of containing errors. It is almost inevitable that, when substantial numbers of largely unrelated pieces of information are placed by humans in electronic pigeonholes, errors are going to be made. With well over 600,000 data items in the database, MinIdent-Win is likely to be no exception. However, in the new version, we have gone to some lengths to minimize their number. A companion program has been developed that tests all new entries not only for obvious

(Cont'd on page 20)

CONFERENCE REPORTS

INTERNATIONAL SYMPOSIUM ON VANADIUM

BY MEHMET F. TANER¹

Vanadium

*Vanadium from Vanadis,
Goddess of Norse folk-lore,
Strengthen the steel that serves us,
Toughen our iron ore.
Go – get the fumes that exhaust us,
Muffle the mighty jets' roar,
Crack up the compounds that plague us,
Help us to find more ore.*

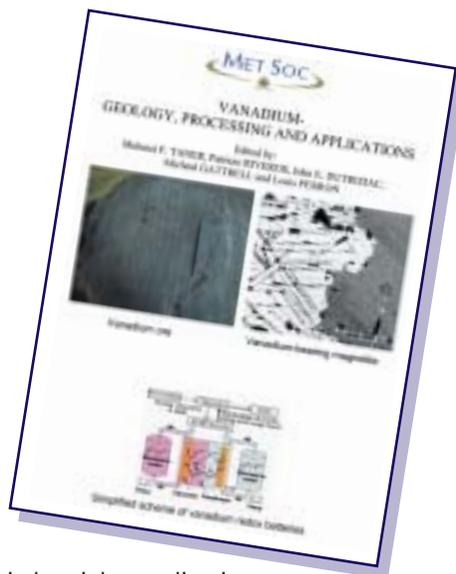
E.R. Rose (1973)

An International Symposium on Vanadium, organized by Dr. Mehmet F. Taner, was held in conjunction with the Conference of Metallurgists in Montreal, Canada, on August 11-14, 2002. Vanadium is a strategic metal having many important industrial applications. It is widely used to toughen and strengthen steels. Vanadium foil is used as a bonding agent in cladding titanium to steel and generally by the aerospace industry. Medical implants often contain vanadium alloys because of their excellent stability. Some vanadium compounds have catalytic properties that make them useful in many

(cont'd from page 19)

formatting or spelling errors but also for consistency of interrelated properties; thus, it looks for summing errors and then checks the size and variation of parameters against expected ranges and limits.

Amongst the many new features that have been introduced are automatic identification from composition for 'probe users, a compilation of cathodoluminescence and fluorescence characteristics, images and hand specimen properties for the more common minerals, and a facility that allows users to incorporate their own images and data. MinIdent-Win© now has all of the bells and whistles one has come to expect in modern Windows™-based software, from an intuitive interface to cut-and-paste, easy printing, and extensive on-board help facilities. It is scheduled for release in three different editions (Professional, Collector's and Student's) in March 2003. Interested readers can find more details at www.micronex.ca.



industrial applications, such as the production of sulfuric acid. The vanadium redox battery is an exciting new development, which has found uses in load leveling, back-up power, and for storage of electricity from wind and solar power. The symposium covered various aspects of vanadium and its industry, including the production of vanadium oxides and ferrovanadium, and the latest discoveries, developments, and emerging markets. Keynote lectures were given by internationally known experts in the areas of interest to the vanadium industry. Original papers were presented in four sessions.

Session I on History, Geology and Mineralogy contained six talks. "Two Hundred Years of Vanadium" by *F. Habashi*, explained the historical development of vanadium metal since its discovery in 1801; "The Vanadium Industry: A Review" by *L. Perron*, provided a detailed analysis of the vanadium industry in the world, including production, price, marketing, and new applications. In "Roof Rock Assimilation in the Doré Lake Complex and its Influence on Vanadium Concentration", *G.O. Allard* gave an excellent talk about the geological environment of the Chibougamau vanadium deposits in Québec and the role of roof rock assimilation in magma chambers in the formation of vanadium deposits; "Mineralogy of the Matagami and Chibougamau Vanadium Deposits, Abitibi, Québec, Canada" by *M.F. Taner, T.S. Ercit and R.A. Gault*, reviewed the mineralogy of Matagami and Chibougamau vanadium deposits in the Abitibi greenstone belt, Québec and discussed where the vanadium is located in the

vanadium ore structure; "Titanium – Vanadium Resources in Southern Québec: the Anorthosite Link" by *S. Perreault*, explained the relations between titanium and vanadium resources in the Grenville Province, Québec; and "Vanadium Resource Potential at Matagami, Québec" by *G. Arnold and M. Allard*, gave detailed geological and geophysical information on recently discovered vanadium deposits at Matagami, Québec.

The other three sessions covered the processing aspects (three talks), electrochemical applications (four talks), and extractive metallurgy (six papers). In conjunction with the symposium, Professor M. Skyllas-Kazacos, from the School of Chemical Engineering and Industrial Chemistry, University of New South Wales, Sydney, Australia, gave a very successful short course on **Electrochemical Energy Storage Systems and Applications**. The one-day short course described the principles of electrochemical energy systems and the fundamentals of electrochemistry, secondary batteries, and fuel cells. Advanced batteries for stationary and mobile applications were described, including the features and characteristics of the Vanadium Redox Flow Battery, the Sodium-Sulfur, Zinc-Bromine, Sodium-Metal Chloride, Sulfur-Bromine and Lead-Acid battery systems. The criteria used in the assessment of different battery storage technologies were covered, together with calculations of capacity, theoretical and practical energy density, coulombic efficiency, and overall energy efficiency. Important design considerations for maximizing battery energy efficiencies were also discussed.

All papers presented at the international symposium on vanadium were published in a proceedings volume (**Vanadium – Geology, Processing and Applications**, edited by M.F. Taner, P.A. Riveros, J.E. Dutriziac, M.A. Gattrell, and L.M. Perron, ISBN 1-894475-26-7, 265 pages, COM2002). This book is available from the Metallurgical Society of CIM at the cost of CAN\$50.00

To order, contact Mrs. Ronona Saunders, Met. Soc., 1210-3400 de Maisonneuve Blvd West, Montréal, Québec, Canada H3Z 3B8, tel.: (514) 939-2710, ext. 1327; fax: (514) 939-9160; e-mail: rsaunders@cim.org or metsoc@cim.org; website: www.metsoc.org.

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MUSEUM NEWS

BY L. PAUL BÉDARD
PBEDARD@UQAC.CA

"Le Petit Musée" – A New Mineral Display at the Université du Québec à Chicoutimi (UQAC)

Recently, the "Sciences de la Terre" sector at UQAC received the donation of a mineral collection of about 300 fine mineral specimens mostly from Québec, from a private collector, Mario Corneau. As a result, we decided to build a permanent exhibit, accessible day and night, called "Le Petit Musée". Funding provided by the mining company SOQUEM allowed us to hire a student, Claudine Simard, for the summer and to purchase building materials. The mineral showcases were donated by a local museum, "Le Musée du Fjord" in La Baie. Marie-Reine Belzile and Claude d'Amours contributed their free time to make the exhibit a reality. The showcases are on the second floor of the main university building. Since the main goal of the Corneau Collection is science popularization, the exhibit is designed for both children and the layperson. Showcases are low enough that youngsters can

peek in. Minerals are grouped by geographic region to ensure that visitors can relate to what they see. It is very gratifying to see peoples' faces when they realize the beauty of the mineral kingdom in their own backyard; most just don't believe what they see. The interest in the collection was very evident during the university open house, held on November 10, 2002, when the "Petit Musée" was so crowded that we did not have enough guides to help all the visitors. This experience has increased the dynamism of our group towards public awareness of mineral science and confirmed our long-term commitment to mineral and geological science education.

The donator, Mario Corneau, is a self-taught mineral collector with an inspiring passion. His ability to communicate his enthusiasm for minerals is impressive. Leave him with a group for an hour and most of them will develop an interest in mineralogy. He decided to donate his collection when it became too large for his home. He did not want to sell his minerals but wanted the collection to be kept locally and accessible to the general public.



Claudine Simard (student), Mario Corneau (donator), and Michel Belley, rector of the Université du Québec à Chicoutimi, during the opening ceremony of the "Petit Musée" (photo by Denis Blackburn)

We now hope to acquire further collections, which will help us improve the public's awareness of mineral sciences.

Moreover, we intend to develop educational materials for schools in the Saguenay Region.



Part of the crowd during the opening ceremony of the "Petit Musée" (photo by Denis Blackburn)

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- R. Lauf, TN

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- David Mossman, *The Canadian Mineralogist*

"Thank you!"
- W. Buchowiecki, PA

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OUTSIDE NEWS

SECRETARY'S REPORT ON THE IMA 18TH GENERAL MEETING

BY MARYSE OHNENSTETTER
MOHNEN@CRPG.CNRS-NANCY.FR

The 18th General Meeting of the International Mineralogical Association (IMA) was held from September 1-6, in Edinburgh, Scotland. Organized jointly by the Mineralogical Society of Great Britain and Ireland and by a group based in Edinburgh, the meeting was a success (see Newsletter 68). Special thanks are addressed to the new President of IMA, Ian Parsons, to the many volunteers involved in the preparation of the congress, and to members of the Mineralogical Society and staff from Edinburgh University. What follows summarizes the main decisions made during the last Business Meeting and Council Meeting.

New Council

The new Council met on Friday, September 6. Following normal procedures, Tony Naldrett became Past President. Incoming Councilors had been elected during the second Business meeting held the day before. Ian Parsons, in charge of the overall organization of the Edinburgh meeting, was elected President and Cornelis Klein was re-elected as Treasurer. Takamitsu Tamanaka was elected 1st Vice-President in view of the role he is playing as organizer of the 2006 meeting in Kobe, and Nicolai Yushkin was elected 2nd Vice-President. Interim Secretary Maryse Ohnenstetter was appointed as Secretary. Councilors Alain Baronnet, Ian Campbell, and Werner Schreyer were joined by Kari Kojonen from Finland and Marcello Mellini from Italy. Stefano Merlino stepped down as Past President. The Council will still benefit from his wise advice during the next

Council Meeting, which will be held on April 5, 2003, in Nice.

Changes to the IMA Constitution

Tony Naldrett opened the General Meeting with a comprehensive address on the status of IMA, pinpointing the lack of visibility of IMA in the 4-year interval between general meetings. Amendments to change the constitution and proposals to improve the IMA's impact were published in the abstracts volume of the Edinburgh meeting. Following his suggestions, four amendments to the by-laws of the Constitution were accepted during the second Business Meeting. Articles 12 (f) and 13 (d) indicate that annual reports should be provided by the chairmen of commissions and working groups. Two other articles (12h, 13f) were added giving Council the authority to replace officers when the scientific activity of any commission or working group is judged insufficient by Council. In addition, the proposal to hold a business meeting every two years instead of every four was accepted. The next business meeting will therefore take place during the 32nd International Geological Congress in Florence, Italy, in August 2004.

Commissions and Working Groups

The General Meeting voted to terminate three commissions/working groups: the Commission on History and Teaching, the Working Group on Database and Computer Applications, and the Working Group on Cosmic Mineralogy. Twenty-one officers out of a total of 33 were replaced in the eight commissions and three working groups that will continue. In addition, a member of Council was assigned to serve as a liaison between the Council and each commission/working group. The names and e-mail

addresses of the officers of the various commissions and working groups can be obtained from the IMA website at www.dst.unipi.it/ima

During the past four years, commissions and working groups have sponsored or co-sponsored sessions in seven international meetings: the IMA General Meetings in Toronto (1998) and Edinburgh (2002), the International Geological Congress in Rio (2000), the 4th International Mineralogy and Museums Meeting (2000), the European Crystallography Meeting (2000), the Applied Mineralogy Symposium (2000), and the SGA/IAGOD International Congress on Mineral Deposits (1999). IMA also participated in the ECROFI symposium, EMU schools, and two International Gemmological Conferences. The Commissions on Applied Mineralogy and Ore Mineralogy and the Working Group on Mineral Inclusions regularly organized short courses and workshops.

New developments

The formation of two new working groups is underway. Because mineralogy has a great deal to offer to "environmental science", including matters related to health, the Council proposed the formation of a Working Group on Environmental Mineralogy. David Vaughan has accepted the chairmanship of this group and has proposed Cathy Skinner as secretary. The second working group, headed by Franz Rietmaier, will be devoted to astromineralogy. In addition, a Committee on Computer Applications is now working at updating the IMA website. Several commissions and working groups plan to develop their own websites, to update databases on minerals and to improve communication among mineralogists.

In the future, IMA will increase its contribution to international meetings, independent of the General Meeting. IMA has proposed five sessions at the EGS/EUG/AGU joint assembly in Nice, April 2003. For the 32nd IGC in Florence, 2004, IMA is organizing a symposium on mineralogy (G15), comprising 12 sessions, and will also sponsor or co-sponsor ten other sessions in other symposia. Collaboration with other international organizations in 2005 is being pursued actively. The 19th General Meeting of IMA will be held in Kobe, Japan. There are two proposals for the venue of the 20th General Meeting in 2010, either Paris or Budapest.

CREATE A LOGO FOR IMA AND WIN US\$200 PLUS FREE REGISTRATION AND ACCOMMODATION AT IMA 2006 IN KOBE, JAPAN!

The International Mineralogical Association is the only truly international organization promoting mineralogy. It is supported by subscriptions from 38 mineralogical societies and groups worldwide.

The Council of IMA invites any member of one of the subscribing organizations to design a logo to be used in the Association's official and promotional material. The winning design will be chosen by the Council of IMA at the IUGS meeting in Florence in August 2004.

Designs, in both coloured and black-and-white versions, should be submitted electronically to the Secretary of IMA, Dr Maryse Ohnenstetter:

mohnen@crpg.cnrs-nancy.fr
not later than March 31, 2004.

For information about IMA, details of the rules of the competition, and technical details to which the designs must conform, visit the IMA website at:

www.dst.unipi.it/ima

OUTSIDE NEWS

ICDD NEWS

BY HELEN M. McDONNELL
MCDONNELL@ICDD.COM

2003 Ludo Frevel Crystallography Scholarships

The ICDD Ludo Frevel Crystallography Scholarship Committee has selected six recipients for the 2003 Scholarship program. These recipients were selected, on a competitive basis, from 34 commendable applications received by the Scholarship Committee. The recipients are:

Kacey Claborn of The University of Washington, USA for research involving "Measurement of Optical Rotation in the Achiral Crystals of Pentaerythritol"; Sean Dalrymple of The University of Calgary, Canada for exploration into "Flexible Hydrogen Bonded Networks via Second Sphere Coordination"; Desiree Fong, of McGill University, Canada for her interest in "Substrate Binding Properties and Reaction Mechanism of an Aminoglycoside-Modifying Kinase"; Erwann Jeanneau of Université de Rennes, France for studies on the "Design of New Mixed Oxalates With Open-Framework Structures Based on MO₆ Building Units"; Chong Lim of the University of Illinois, USA for research concerning the "Crystallographic and Structural Studies of Cobalt Silicide Formation on Si(001)"; Andrew Locock of University of Notre Dame, Indiana, USA, who is investigating "Crystal Structure and Synchrotron Radiation Study of Uranyl Oxysalts of Phosphate and Arsenate—Implications for Remediation".

The ICDD will present each of these students with a cheque in the amount of \$2,250, to assist in the continuation of studies in their selected fields of crystallographic research.

Scholarship awards are made possible by donations from both individuals and corporations to the Ludo Frevel Crystallography Scholarship Fund.

McMurdie Award to Camden R. Hubbard

Dr. Camden R. Hubbard, Oak Ridge National Laboratories, Oak Ridge, TN received the 2002 McMurdie Award at the 51st Annual Denver X-ray Conference in Colorado Springs, CO, USA. This award recognizes Dr. Hubbard's contributions to the computer-aided evaluation of X-ray powder patterns and editing of the Powder Diffraction File™ (PDF®), as well as his work in enhancing the accuracy of powder methods of X-ray crystallography.

Dr. Hubbard and his coworkers at the National Bureau of Standards, now the National Institute of Science and Technology, developed NBS*AIDS83 as a significant computer-aided editorial tool used to evaluate and quantify the quality of X-ray powder diffraction data. This program and its derivatives have been used by the International Centre for Diffraction Data (ICDD) editors for over 20 years to evaluate approximately three hundred thousand diffraction patterns. This has created a statistical standard for quality for diffraction data. Dr. Hubbard was also heavily involved in the design and creation of the PDF-2 digital database used worldwide in automated powder diffractometers.

In 30 years of exceptional membership in the ICDD, Dr. Hubbard has been involved in nearly all aspects of shaping and creating the Powder Diffraction File, and in transforming it from a paper product to an active relational database. His recent experiences as Senior Research Staff and Leader of the Diffraction and Thermophysical Properties group at Oak Ridge National Laboratory has led to enhanced data, methods, and practices for advanced materials and non-ambient diffraction processes.

Named in honor of Howard McMurdie, long-time editor of the ICDD Ceramics Subfile, the McMurdie Award is presented every two years for distinguished work, which improves the Powder Diffraction File™ in its purpose of identifying and characterizing inorganic solids. In 2000, Gregory P. McCarthy was named the first recip-

MEETING CALENDAR

June 7-12, 2003

Classic Clays and Minerals, Athens, Georgia. A jointly held meeting of the Mineralogical Society of America and the Clay Minerals Society sponsored by the University of Georgia. Abstract submission deadline April 4, 2003. For more information, www.gly.uga.edu/CMS2003/ or contact Paul Schroeder at schroe@uga.edu

June 22-26, 2003

Euroclay2003, Modena, Italy. The conference of the European Clay Group Association. The second circular and detailed information are available at www.unimo.it/euroclay2003. You can contact Maria Franca Brigatti at brigatti@unimo.it

June 22-27, 2003

8th International Kimberlite Conference, Victoria, BC, Canada. For information, <http://venuewest.com/8IKC/> or e-mail 8IKC@venuewest.com

August 10-14, 2003

Geoscied IV: Earth Science for the Global Community, Calgary, Alberta. The fourth international meeting of Earth science teachers (elementary to university) with professionals who deliver Earth science outreach programs, in order to share ideas and concepts in teaching and supporting an integrated understanding of the Earth. An innovative technical program will include workshops, oral, and poster sessions. An exciting field trip program will include many of Calgary's local world-renowned geological sites such as the Royal Tyrrell Museum of Paleontology and, within the Rocky Mountain World Heritage Site, the Burgess Shale and the Icefields Parkway. Visit www.geoscied.org for details.

August 24-28, 2003

Mineral Exploration and Sustainable Development, Athens, Greece. 7th biennial meeting of the Society for Geology Applied to Mineral Deposits. For more information, www.igme.gr/sgaconference.htm or eliopoulos@igme.gr

September 7-12, 2003

Frontiers in Geochemistry, the Goldschmidt Conference, Kurashiki, Japan. For more information, www.ics-inc.co.jp/gold2003/ or gold2003@ics-inc.co.jp

September 9-12, 2003

9th Euroseminar on Microscopy Applied to Building Materials, Trondheim, Norway. Further information can be found at: <http://this.is/ergo/efarin/>. Contact Chairman Viggo Jensen (viggo.jensen@nblt.no) or Secretary Maarten Broekmans (maarten.broekmans@ngu.no).

August 20-28, 2004

Italia 2004 – From the Mediterranean Area Toward a Global Geological Renaissance, Florence, Italy. 32nd International Geological Congress. For more information, www.32igc.org/default1.htm or secretariat@32igc.org

For an exhaustive listing of meetings of mineralogical interest, see Dr Andrea Koziol's web page at <http://homepages.udayton.edu/~koziol/meetings.html>

PUBLICATIONS 2003

MINERALOGICAL ASSOCIATION OF CANADA

Environmental Aspects of Mine Wastes

Editors: J.L. Jambor, D.W. Blowes & A.I.M. Ritchie
Short-Course Volume 31, 2003

This volume covers a wide spectrum of environmental issues related to mine-waste solids and effluents. Topics include mine-waste geology, hydrology, mineralogy, geochemistry, microbiology, drainage prediction, remediation, advances in ARD modelling, and case studies. The volume provides entry-level familiarization with the various topics of primary concern in studies of mining-related wastes, but also covers advances that have been made in these and related fields over the past decade.

ISBN 0-921294-31-X
SC31, ±440 PAGES, 2003

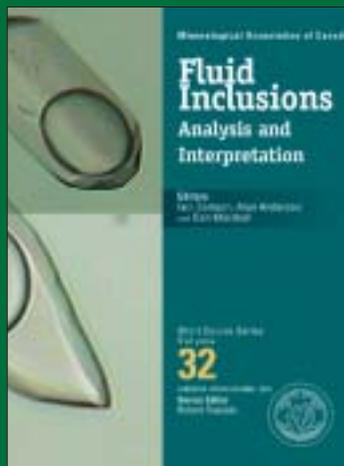
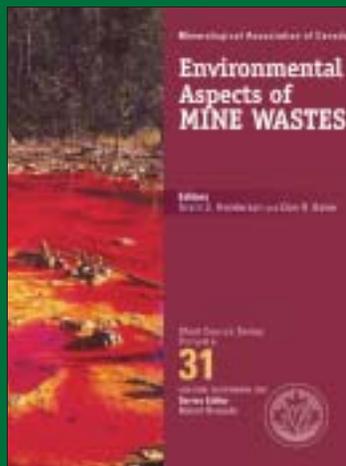
Mineral Species Discovered in Canada And Species Named after Canadians

By L. Horváth

This annotated and illustrated compendium focuses on the 206 mineral species discovered in Canada or redefined from Canadian localities in the last 222 years. It also highlights 30 minerals named after Canadians but discovered outside Canada, and includes a section on obsolete names of mineral species first described from Canadian localities. The book also gives a brief historical overview of works documenting mineralogy in Canada from its beginnings in 1752 to the present. Appendices cover the chronology of mineral discoveries, individual type-localities, type-mineral specimens and their repositories, chemical classification of type-minerals, an author index, and general references.

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(member price US\$36/CAN\$36)



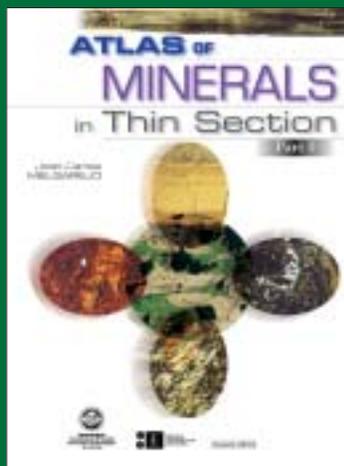
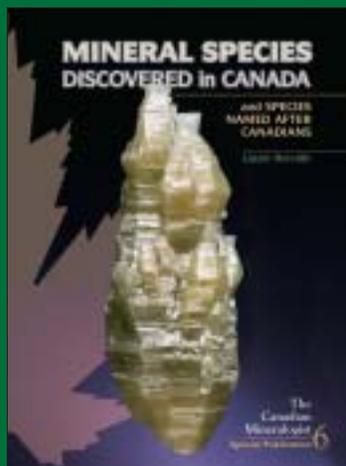
Fluid Inclusions: Applications and Analysis

Editors: I. Samson, A. Anderson
& D. Marshall
Short-Course Volume 32, 2003

This short-course volume covers all the basic and many advanced aspects of the analysis and interpretation of fluid inclusions. It outlines what fluid inclusions are, what types of data can be obtained from them, the approaches and techniques that can be used to analyze fluid inclusions, how data are processed and interpreted, and where the limitations and pitfalls of the various techniques lie

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