NEWSLETTER
OF THE MINERALOGICAL
ASSOCIATION
OF CANADA

NOUVELLES
DE L'ASSOCIATION
MINÉRALOGIQUE
DU CANADA

April 2001
Avril 2001

64

COLOURED FISH EARS: CATHODOLUMINESCENCE AS A GUIDE TO VARIATION IN AQUEOUS ENVIRONMENTS

By Norman M. Halden, U. of Manitoba

Otoliths are calcified structures located in the inner ear of bony fish. They are constructed of alternating layers of aragonite and protein called annuli and are typically used to age fish (Chilton & Beamish 1982). More recently, chemical analyses of individual annuli have been used to assess fish behaviour and variations in the environment occupied by the fish (Halden *et al.* 2000). From a biological perspective, age information is important because it provides valuable information needed for fish conservation. From an Earth and environmental perspective, otoliths are minerals. Otoliths present us with the typical problems of mineral analysis and interpretation but they also offer us a unique insight into how minerals record changes in the environment; moreover they often come in particularly succulent wrappers (fillets).

Cathodoluminescence (CL) emissions are particularly sensitive to the presence of very low levels of trace elements; those of us who have studied diagenesis in limestones are likely familiar with the orange Mn-activated luminescence seen in calcite. Oscillatory zoning and growth zones in diagenetic cements have been linked to variations in water chemistry. Otoliths are very similar in that they preserve an annular record of the fish's growth history; they also absorb a variety of trace elements (Fig. 1 and 2). This may afford the fisheries researcher the opportunity to use CL in assessing chemical variation, and hence water chemistry variation, on at least an annual time scale.

Otoliths were taken from fish collected (that is, angled and netted - another very difficult aspect of this

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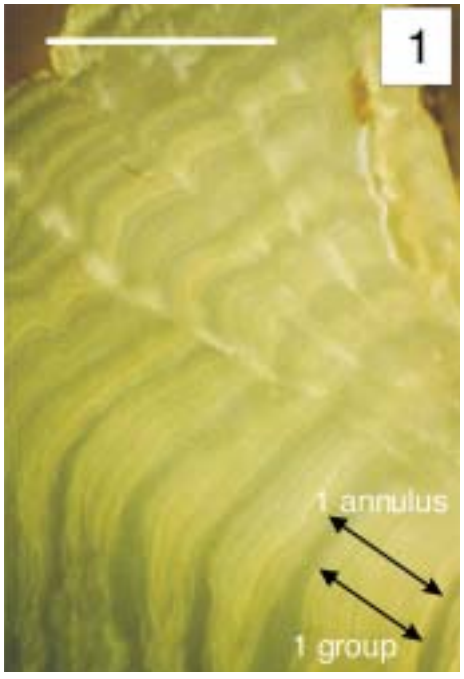

Figure 1: CL photomicrograph of a pike otolith showing distinguishable annuli and groups of periodically deposited rings (within the annulus); scale bar in this and subsequent pictures is 0.5 mm.

Figure 2: CL photomicrograph of a lake whitefish otolith; the annuli corresponding to years 1, 2 and 3 are brighter than the outer annuli and are made up of a number of annular rings.

SUMMARY

This newsletter constitutes an insert to *The Canadian Mineralogist*, Volume 39, Part 2

EDITORIAL

MINERALOGY OR MINERALOGICAL SCIENCES?

BY NORM HALDEN, VICE-PRESIDENT

Gunter Faure, at the beginning of his text on inorganic geochemistry, quotes Faul and Faul (1983) … "Geology began when early man first picked up a stone, considered its qualities, and decided it was better than the stone he already had. Good stones were useful and they were collected, mined, and traded." One could say that this early human was at least in part a mineralogist, as the properties of stones were imparted by their mineralogy.

Today we still collect, mine and trade rocks and minerals based on their properties. Intrinsic properties like hardness are still very useful. However, we now have the ability to process minerals into something quite different from their original form and this shifts the material farther and farther from a natural equilibrium and usually imparts greater value in an increasingly complex marketplace. In the past, we unquestioningly extolled the benefits of this. Now, having examined and understood some of the negative aspects, it is clear we have more work to do. Radioactive waste and mine tailings are two of the more obvious materials that require additional work.

As we ponder the question "are we doing mineralogy or mineralogical sciences?" I thought it might help if we first asked who are mineralogists or who are mineralogical scientists? Since we are all descendents of that first early human, it is anyone who collects, mines, and trades minerals as well as, now, assesses the properties of minerals. Whether we do it for profit or just for the love of knowing, we can't deny that we have this much in common. Who did that early man trade with; why did he mine? If the other person did not have knowledge of mineralogy or was undirected in his mining, then he was at a serious disadvantage. This is as true today.

I appreciate that labels are important and that describing ourselves as either mineralogists or mineralogical scientists will impact on how others perceive us. However, in this day and age, everyone understands profit and everyone understands environmental change. Perhaps reflecting on our roots, as MAC evolves into the future, we need to make it clear to the society around us that understanding minerals confers an economic and environmental advantage. Either way, if the mineralogist or mineralogical scientist can be seen as improving our quality of life, the name will matter less than who is perceived as being responsible.

Faul, H. & Faul, C. (1983): It Began with a Stone. Wiley, New York, 270 pp.

FROM THE NEWSLETTER EDITOR

A PINCH THEME

This Newsletter definitely has a Pinch theme to it. First, MAC awarded the first Pinch Medal to Mr. William W. Pinch at the Tucson Gem and Mineral Show in February. The citation and response by Mr. Pinch are presented on page 5. In the early 90s, the Canadian geoscience community rallied to raise $5 million so that the Canadian Museum of Nature could buy the William W. Pinch mineral collection. We profile this museum in our feature *Museum News* and present an update on the Pinch Collection on page 12. We also introduce *New Minerals 1995-1999*, whose front cover has a dazzling picture of the only known sample containing andyrobertsite and calcio-andyrobertsite. And this sample belongs to Mr. Pinch.

Or Mineral Sciences?

Our vice-president's editorial sent me to my dictionary, looking for definitions. My Webster's defines mineralogy as the scientific study of minerals and mineralogical as "about minerals". Why not use the expression "mineral sciences", which surely means the sciences about or dealing with minerals? I have heard too many members of the public stumble trying to say the word "mineralogical" and many don't understand it.

On Serendipity

Concerning our feature article on *Coloured Fish Ears*, I really like the story Norm tells about how he got involved studying fish otoliths. He was visiting his brother-in-law, a physical oceanographer at the DFO labs in St. Andrews. When he looked through a microscope at fish otoliths and saw the growth structures, he immediately wondered if he could apply the study of mineral zoning by PIXE to that of otoliths. This technology transfer has proven to be an exciting new contribution of the mineral sciences to the biological sciences and... an excellent way to marry Norm's passion for fishing with his research!

Some Things Don't Change Much

Reading Al Steacie's comments on the fledging MAC, I was struck by the fact that his description of the situation of mineralogy over 40 years ago fits pretty much with how we would describe it today. At our last executive meeting, we wondered why so few laboratories and mining companies subscribe to our journal, even though mineralogy is so basic to what they do. In our last Newsletter, we reprinted a letter addressed to NSERC by our president, in which he expresses concern about the potential separate submissions of Solid Earth Sciences and Environmental Sciences. Just as 40 years ago, we are still struggling to find ways to educate the public and policy makers about the importance of mineralogy.

One More Reason to Visit Quebec City

I was at the recent opening of a stunning exhibition on Diamonds, running at the Musée de la civilisation in Quebec City until January 2002. This exhibit, sponsored by Birks, was prepared in collaboration with the American Museum of Natural History, which has provided 200 of the 400 artefacts. To my delight, the exhibition is very well done, and includes the description of the crystal structure of this unique mineral, the geological environments where it is found, and the history of diamonds through the centuries. Many of the pieces of jewelry were gathered from various European museums and are magnificent.

Pierrette Tremblay

Continued from page 1

work) in Eden Lake, which is located in northern Manitoba (Fig. 3). The lake is bordered on its east side by the Eden Lake Complex, a small monzonitic intrusion described by Halden & Fryer (1999). The complex incorporates a number of peg-matitic segregations, which contain a suite of REE-bearing silico-phosphates (britholite and allanite in particular) as well as Sr- and Ba-bearing carbonate minerals including strontianite (Arden & Halden 1999). Chemical and image analyses show that the britholite has an annealed polygonal texture that has undergone hydrous alteration resulting in the loss of La and Ce and a gain in H_2O; this alteration is most likely due to water percolating along polygon grain boundaries. Geochemical surveys at Eden Lake by Fedikow *et al.* (1994) show elevated concentrations of REE, Sr, Ba, Cu, and Zn in the vegetation and sediments surrounding the lake. This indicates that these elements are mobile and available to the ground and lake waters.

Sagital otoliths were collected from fish that were gill-netted at six locations in Eden Lake, four in the immediate vicinity of the complex and two at inflow sites away from the complex. Species caught and sampled included walleye, northern pike, lake whitefish, white sucker, longnose sucker, cisco, yellow perch, and burbot. One of each pair of otoliths was embedded in epoxy resin and a transverse cut was made to create a dorso-ventral cross section through the core of the otolith, exposing all annuli. The posterior half of each cut otolith was re-embedded in a 25 mm leucite microprobe mount. The exposed otolith surfaces were ground with silicon carbide, then polished. The CL

Figure 3: Norm Halden hard at work sampling otoliths.

instrumentation used consisted of a Nikon microscope equipped with a Technosyn cold-cathodoluminescence stage. Typical beam conditions were 20 kV and *ca.* 300 mA. Images were collected on film and captured digitally. When using film, photographs were taken under CL of all the otoliths showing moderate to strong luminescence; exposure times were usually less than 400 seconds using Kodak 400 ASA film.

Figures 1 and 2 show the CL images of otoliths taken from northern pike and lake whitefish. Typical luminescence varies from yellow-green to green alternating with dark blue. Most Eden Lake walleye and white suckers showed weak to no luminescence regardless of where they were caught in the lake. Northern pike otoliths showed the most intense luminescence, which was usually confined to discrete groups of bright luminescent lines, usually 4 to 12 lines per group. These groups correspond spatially to optically white bands in reflected light images and can therefore be interpreted as having developed during a period of summer growth. Cisco, lake whitefish, and yellow perch all exhibited strong luminescence that was restricted to a few particular annuli. All three species frequently showed years wherein annuli appeared to have higher concentrations of activator elements and years wherein they appeared to have incorporated little or none at all. The luminescence was also brightest in the optically white bands (in reflected light) of each annulus in all three species, as was observed in the northern pike.

Even though green and yellow-green luminescence was predominant, three otoliths, from a walleye, a cisco, and a sucker, showed red luminescence. The white sucker otolith (Fig. 4) showed strong red luminescence that was brightest in the core but continued through to the edge of the otolith. The walleye otolith displayed no luminescence in the core (typical for Eden Lake walleye) but then bright red luminescent lines appeared in the later annuli (Fig. 5). The luminescence in this otolith varied in a "cyclical" fashion in that each annulus had a bright luminescent line defining the start of the annulus followed by less luminescent lines until the next annulus.

Scanning proton microprobe analysis showed that Mn distribution was variable across the majority of the otoliths and ranged from 2 to 205 ppm. Mn also showed an overall oscillatory pattern with the highest concentrations being spatially linked to the brightest luminescence. High levels of Sr were detected in all 28 otoliths ranging from 100 to ~1500 ppm.

Cathodoluminescence is usually attributed to structural defects or trace element substitutions. Defects usually occur on the atomic lattice scale. High Resolution Transmission Electron Microscope (HRTEM) images of northern pike otoliths show complex zoning at a nanometer scale in the form of 100 – 200 nanometer regions of 20 nanometer oscillatory zoning separated by large regions of homogeneous crystal structure (Meldrum & Halden 1999). The 20 nm zoning is in fact twinning resulting from a 15° structural offset in the aragonite crystal structure (Meldrum & Halden 1999). This offset may have developed in response to the crystal structure accommodating a trace element such as Mn or Sr. Manganese is one of the most common causes of luminescence in carbonates; in aragonite Mn causes a typically yellow-green luminescence with a peak at about 540 nm (Marshall 1988). Most of the luminescence seen in the Eden Lake otoliths is yellow-green. Proton-Induced X-ray Emission (PIXE) line scans show that there is a spatial correspondence between the distribution of high Mn contents and the brightest luminescent lines, which would support the idea that Mn was the principal activator element responsible for the luminescence. In addition to Sr, Mn and Zn, other trace elements found in otoliths at the ppm level

include Ba, Fe and Cu. The luminescence in the whitefish otoliths, which corresponds to a few specific annuli, also appears to correspond to high values of Sr. Sr can act as a "sensitizor" for luminescence in carbonates (Marshall 1988), which might account for variations in the intensity of the luminescent signal in some otoliths. Sommer (1972) showed Sr can promote a shift in the peak emissions of Mn-activated luminescence in aragonite to 590-600 nm – towards the red end of the spectrum.

Studies aimed at understanding the concentration of trace elements in marine organisms show that food is probably a significant factor in the overall uptake of trace elements such as Zn. While Mn may be incorporated in food, it may also be absorbed through the gills; here the uptake is influenced by water pH and alkalinity (e.g. Bradley & Sprague 1985). The Eden Lake Complex contains very high levels of Sr. It is the most likely source for that element, although the pathway of incorporation through food or the gills is not known. It is harder to ascertain the source of Mn as it is more common in the environment. However, the Eden Lake Complex,

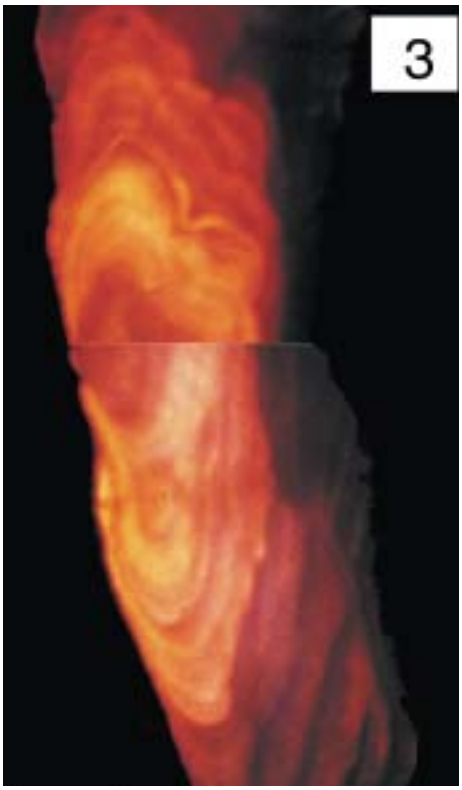

Figure 4: Photomicrograph showing red cathodoluminescence in a white sucker otolith.

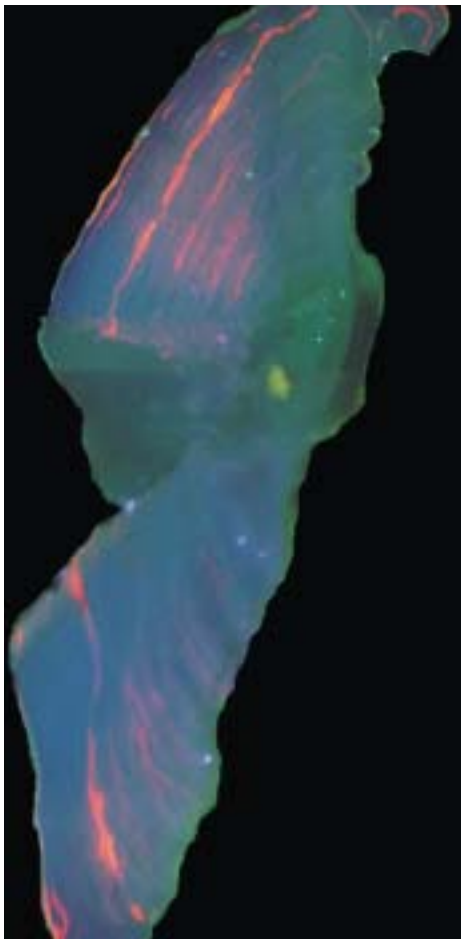

Figure 5: Photomicrograph of a walleye otolith showing red cathodoluminescence at the edges of annuli; the intensity of the signal varies across the otolith – some edges show up more conspicuously than others.

which we know is weathering into the surrounding environment, contains between 400 and 1200 ppm Mn.

The incorporation of trace elements in otoliths crosses the interface between the inorganic and organic world. Sr found in the otoliths from fish in Eden Lake reaches levels in excess of 1000 ppm. These levels are more typical of marine fish as typical fresh water levels range between a few ppm to about 400 ppm. Eden Lake is ca. 500 km from the sea – and given these are freshwater species we know these fish didn't swim that far! Sr is present in the Eden Lake complex to levels in excess of 3700 ppm. In addition, Ba was detected in the otoliths at a few ppm and is present in the complex up to 6700 ppm suggesting that both Sr and Ba were originally derived from the surrounding rocks.

Carbonate minerals in rocks commonly luminesce and preserve a chemical record of their growth; the same is true for otoliths. To interpret correctly what the zoning signals mean in terms of environmental change, we will require data on the environment surrounding the fish habitat (including rock, mineral, and water chemistry) and the ability to analyze the otoliths, a skill largely resident in the mineralogists and geochemists who participate in this work. CL microscopy of otoliths is yet another useful mineralogical tool that will assist our understanding of chemical variation in the environment and, as such, contribute to fish management and preservation strategies.

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ASSOCIATION NEWS

MAC RECEIVES GRANT FROM NATURAL RESOURCES CANADA

Natural Resources Canada contributed $4000 towards the start-up cost of publishing *The Canadian Mineralogist* electronically, through the Geological Survey of Canada's Grants and Contributions Program. This type of partnership is very encouraging. The GSC has always been a strong supporter of the various geoscience organizations in Canada. In the past, the GSC has supported our Poster series for distribution to schools, and it continues to support the Abstracts volume for the annual GAC-MAC meeting. MAC published a thematic issue in honor of the 150th anniversary of the GSC in1992. Two recent thematic issues of *The Canadian Mineralogist* (volumes 38-2 and 35-6) were designed to complement the upcoming publication of the tectonometamorphic map of the Canadian Shield by the GSC.

SHORT COURSE 2002

Grant S. Henderson and Don R. Baker are hard at work preparing a short course on **Earth, Environmental and Materials Science Applications of Synchrotron Radiation**. It will be held on May 25 and 26 on the University of Saskatchewan campus, prior to the 2002 GAC-MAC meeting, in Saskatoon.

The short course will introduce the Earth sciences community to what synchrotron radiation is, what the latest techniques are, what types of Earth, environmental and materials science problems can be investigated using synchrotron techniques, what the Canadian Light Source can do, how one gains access to the CLS and other sources, and how data are reduced and analyzed for specific techniques.

Most of the material will be at a level of understanding for most upper undergraduate and graduate students although recent results and ideas presented throughout the lectures will appeal to both pure and applied researchers working on Earth, environmental and materials sciences. The presentations of the first day (90-minute lectures) will be broad overviews of different aspects of synchrotron research in order to introduce the novice synchrotron researcher to what exactly are synchrotrons and what use they do have. The second day is dedicated to more specific applications and some of the lecturers will bring raw data sets with them and go through the reduction and analysis of the data with the audience (where appropriate). On the afternoon of the second day, there will be a tour of the Canadian Light Source.

Speakers will include G. Henderson, University of Toronto; D. Baker, McGill University; G. Michael Bancroft, Director, and De-Tong Jiang, Canadian Light Source, Saskatoon; Gordon E. Brown, Stanford Synchrotron Radiation Laboratory, Stanford University; T.K. Sham, Department of Chemistry, and H. Wayne Nesbitt, Department of Earth Sciences, University of Western Ontario; J.S. Tse, Steacie Institute for Molecular Sciences, NRC, Ottawa; and John B. Parise, Departments of Geology and Chemistry and Centre for High Pressure Research, SUNY, Stony Brook.

For more information, contact Grant S. Henderson at henders@geology.utoronto.ca

PINCH MEDAL AWARDED FOR THE FIRST TIME

BY FRANK HAWTHORNE

Mineralogy is one of the few scientific disciplines in which the amateur can still contribute significantly to current scientific progress. In order to recognize these contributions, the Mineralogical Association of Canada has instituted a new award: the Pinch Medal (see Newsletter 63, page 5, December 2000, ***Association News*** by Peter Burns). The initial awarding of the Pinch Medal is to Mr. William Wallace Pinch of Rochester, New York, for his major contributions to mineralogy. Indeed, it was the work and unstinting generosity of Bill Pinch that led to the conception and naming of this award, and so it is particularly fitting that he be the first recipient. At the Tucson 2001 Gem and Mineral Show in Tucson, Arizona, February 7-11, 2001, the medal was awarded at noon during the Joint Mineralogical Society of America/Friends of Mineralogy Symposium on Saturday February 11, followed by a small private dinner at the Mountain Oyster Club. Bill's wife Jackie, daughter Megan, son Michael, and Michael's girlfriend Stefania were in attendance. Frank Hawthorne made the presentation, and Bill Pinch responded with a short speech; the texts are given below.

Citation

Ladies and gentlemen, today you are participating in a ceremony that will become a biannual feature of the Tucson Show, the awarding of the Pinch Medal. As you are all aware, thousands of mineral collectors and dealers worldwide collaborate with the scientific community to the great benefit of mineralogy. Collectors and dealers dominate in the collection and field characterization of minerals. Moreover, many collectors possess a keen eye and are extremely knowledgeable. The result is that most new minerals are discovered and brought to the attention of the scientific community by collectors and dealers. Without this contribution, our knowledge of new minerals would progress at a much slower rate. Why are new minerals important? New minerals are important because they provide us with a more complete knowledge of the products of geochemical processes than we would have if we were unaware of their existence. This is particularly the case in the surficial environment, where many major environmental issues are concerned with the dispersal and fixation of toxic, radioactive, and carcinogenic materials of usually anthropomorphic origin.

The Pinch Medal

Another key issue is that a mineral is not considered adequately characterized until the details of its crystal structure are known. The experimental techniques used for this work are quite demanding in terms of sample characteristics, and it is often the sharp eye of the collector or dealer (who unearths the sample) that finds the one tiny crystal adequate for this purpose.

To recognize major and sustained contributions to mineralogy by the collector-dealer community, the Mineralogical Association of Canada has instituted a major new

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Bill Pinch with his award. He is surrounded by (from left to right) Frank Hawthorne, Charles Key, Robert F. Martin, Pierrette Tremblay, Katherine Dunnell and Terri Ottoway.

award, the Pinch Medal, named for a collector who epitomizes the spirit of what I have been talking about, William Wallace Pinch of Rochester, New York. The recipient of the first award is Bill Pinch himself, in recognition of his enormous contributions to mineralogy through his collaboration with the academic community.

Response

By William W. Pinch

Ladies, gentlemen, and fellow mineral collectors, I feel doubly honoured to receive this medal. In the first instance, the initiation of this award is very appropriate in that, for the first time, it gives formal recognition to the many serious mineral collectors who have contributed to the science of mineralogy. I am very gratified that the first award, the "type specimen" so to speak, has been given to me. In the second instance, the medal is in my name, an honour that most people who have had medals named after them were not around to appreciate. It is the greatest honour of my life, and as just pointed out to me, I am still alive to enjoy it.

First and foremost, I thank my wife Jackie for her love and support throughout our marriage. Before we got married, I told Jackie that there was one thing that she needed to know about me... I collect minerals. At the time, I don't think that she realized what that meant. If she didn't know then, she definitely knows now. With me, mineral collecting hasn't been a hobby; it has been an obsession. But she has stuck with me through it all, and deserves this medal at least as much as I do.

I also thank all of you out there, every dealer who has let me look through his stock, every mineral curator who showed me his collection, every person who has stopped me to show me a mineral and ask or answer a question, and every mineralogist who has done any work on a specimen of mine. In my many years in this business, I have found that the more you look, the more you learn. Helping the professional has only helped me to learn more about mineralogy and to learn what it is that the professionals need to accomplish their goals. Every time a specimen is worked on, it becomes a better-documented specimen, a benefit both to science and to the collector.

I take this opportunity to thank all the dealers, collectors, and professionals who have made the Rochester Mineralogical Symposium a success. A mineral collector who is not satisfied with the information on the label and wants to learn further is a serious collector, and the Symposium was initiated to bring the serious collectors and the professionals together to share information and to learn from each other. The Rochester Symposium has become a great success in this regard, as has the MSA/Friends of Mineralogy Symposium at Tucson.

I wish to thank the Mineralogical Association of Canada for initiating this award and Frank Hawthorne for presenting it to me today. And in conclusion, I want to mention one aspect of this matter that gives me great pleasure: Frank has won nearly every medal I can think of, but he'll never win this one!

ASSOCIATION NEWS

From the Publications Committee

ELECTRONIC ACCESS TO THE CANADIAN MINERALOGIST

BY PIERRETTE TREMBLAY

Now that all the issues of our journal for 2000 are accessible electronically, it is appropriate to compare the print and the electronic media. Each has its own type of immediacy. When I get an issue of Can. Min. in the mail, I enjoy leafing through it after scanning the back cover. Colour photographs typically will grab my attention. It is quite easy and fast to get a quick overview of an issue. And of course, I know the issue is out.

When you access the same issue of Can. Min. online, starting with the first issue of 2001, you first have to type your password (if you access through your library, your institution has provided us with IP addresses and you do not need a password). I suggest you read the abstract first before trying to access a full-text article, as abstracts appear instantly. With a good high speed connection, downloading a whole file will take between a few seconds and a minute and a half, depending on the size of the file; the more graphics and pictures there are, the longer it takes. However, if your internet connection is less than ideal, it could take many minutes to download some of the larger files. When we get impatient, we should remember that ordering an article through the library used to take many days. Try downloading when there are fewer users online, or when you are busy doing something else. Most people find that they prefer reading a printed version of the file rather than reading online.

A search function using keywords is now available on the site. Try it! For example, tourmaline brought 20 hits. The first articles listed had tourmaline in the title while the others had the word in the text. Once again, it is wise to look at the abstract before trying to access the full text.

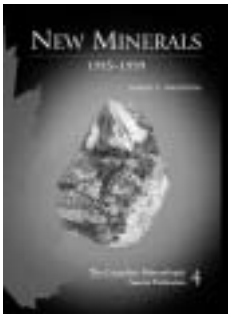
If you have subscribed to the Publications Alert service, you will receive an e-mail message as soon as an issue is available online. You can then immediately check the list of contents, many days or weeks before you receive your printed copy. As soon as the blueprints of an issue of Can. Min. have been approved, our typesetter prepares a CD-ROM of all the electronic files for NRC Research Press, so typically the electronic version is ready before the issue is off the press. If you add the delays involved in mailing and delivery, there could easily be a one month difference for our overseas subscribers.

In the coming year, we will investigate the possibility of posting papers on the web as soon as they are ready. This might make a difference of many months for some papers, especially in the case of thematic issues.

In short, electronic access to the Journal is great but a printed version is still indispensable; they complement each other.

Lastly, you may be wondering why we did not just issue a password to all our members regardless of their potential interest in using the online version of the journal. It is because setting up gates is costly, and because we wanted the opportunity to get a feel for how many members use the electronic version. If you have not requested a password yet, you can do so anytime by sending an e-mail to mac.amc1@sympatico.ca.

If you have any questions or concerns regarding the electronic version of the Journal, do not hesitate to contact me at mac.amc1@sympatico.ca



NEW MINERALS 1995-1999 HOT OFF THE PRESS

When Joe Mandarino approached us to see if we were interested in publishing the sequel to *New Minerals 1990-1994*, published by The Mineralogical Record, we felt that here was an almost ready-made book (all the abstracts have already been published in the Mineralogical Record over the past few years) that fitted exactly the Association's mandate to promote and advance the mineral sciences.

Such a project also seemed to fit nicely with the emphasis given in our Journal to the description of new mineral species. Indeed, in the period 1995-1999, *The Canadian Mineralogist* has published the description of 50 new mineral species and the crystal structure of 16 new species. This is the most published by any journal in the world.

Not only has author Joe Mandarino abstracted the information from 23 different journals, he has also checked it and, in many instances, added unpublished information taken from reports submitted to the International Mineralogical Association. Some additional information has been added since the original abstracts were published as a result of Joe and Bob Martin pouring over the manuscript.

As mentioned above, descriptions of mineral species are published in a large number of journals, in many languages. This, combined with wide-ranging cutbacks in scientific journal subscriptions by libraries, at least in North America, makes it increasingly difficult to locate the primary sources of the descriptions of new mineral species. What you get in *New Minerals 1995-1999*, our special publication 4, are standardized descriptions for ALL of the minerals species described between 1995 and 1999. In contrast to the first three volumes in this series, *New Minerals 1995-1999* has a smaller format and a soft cover to keep the price low. And of course, we added a touch of colour with the beautiful picture of andyrobertsite and calcio-andyrobertsite on the front cover. A bargain at $22. Order your copy today.

FEATURE

A LOOK BACK – SKETCHES FROM THE PAST

BY DR HAROLD STEACY

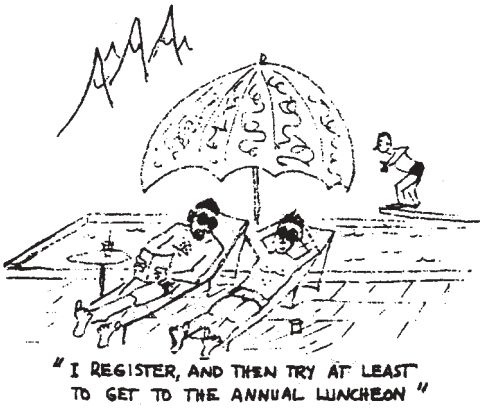
As I looked through old newsletters in search of its history, I came across some very amusing sketches by Dr. Harold (Hal) Steacy. Although Hal has been retired from the Geological Survey of Canada (GSC) for some time, he still frequents the 7th floor and mineralogy lab of 601 Booth St. and attends many Logan Club talks. I thought his drawings were worth sharing with the rest of the MAC membership, for those of you too young or new to have seen them in their original form, and those of you who have forgotten them. I spent some time with Hal and he was gracious enough to answer many of my curious questions about the "olden days" in the MAC. Here are the results of my interview.

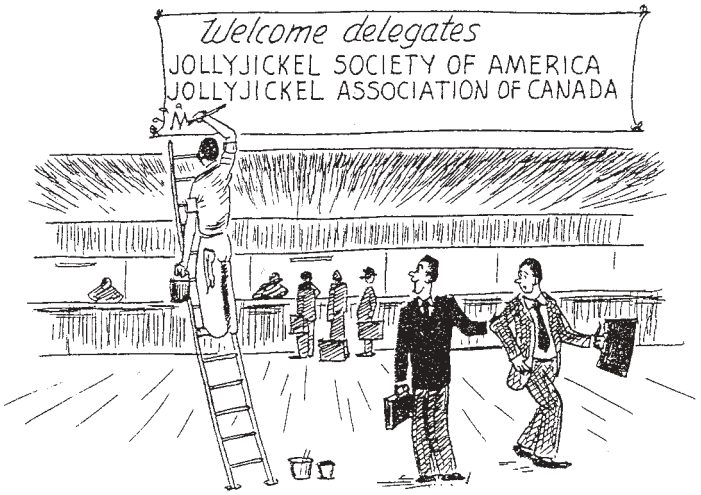
JEANNE B. PERCIVAL (MAC COUNCILLOR)

I became involved in the Mineralogical Association of Canada in 1957 when, on the invitation of Binks Robinson, I accepted the position of treasurer to succeed Digger Gorman of Toronto. I served as the MAC's treasurer for the next nine years. Sol Kaiman of the Mines Branch (next door to the GSC Building) was then secretary and in those pre-fax and pre-e-mail days, it was felt that for ease of communication both the secretary and treasurer should be located in the same city. Sol and I saw a lot of one another in the ensuing years, working closely together on our respective responsibilities and on a number of common projects, such as the revision of the By-laws. It was certainly a more labour intensive period than now, as we had to do all our invoices and mailing by hand. During my tenure I believe I attended and participated in all executive meetings and annual meetings, presenting my annual financial reports, occasionally filling a variety of roles, such as MC, chairman, and speaker. I was especially pleased with a talk delivered on the National Mineral Collection, as it was really the catalyst that led to the appointment of Louis Moyd as the Museum's first full time curator of mineralogy, a role that he filled so admirably. The formative period of the MAC was one of great pride and satisfaction, for finally we had established a national mineralogical association of our own and so entered the international community with our own national identity. In reflecting back on our humble beginning it is now marvellous to see – through the dedicated efforts of so many members – how well the association has grown over the intervening years and the international respect it has achieved.

In its early history, apart from the normal processes of getting an association up and running such as the appointment of officers, drafting of By-laws, establishing the criteria for membership, and setting a schedule of fees, the main problems we faced, as I recall, were in recruiting members, launching and funding our own journal, and organizing and establishing venues for our annual meetings. Fortunately, Len Berry – one of my professors at Queen's University volunteered to serve as editor and the NRC came through with financial support for the Journal. Early annual meetings were held with various organizations, such as PDA, CIMM, and GAC, and even independently, but we eventually moved toward joint meetings with the GAC, and this seems to have worked out well.

My colleague Ann Sabina succeeded me as treasurer and did a marvellous job for many years. Some of the main issues facing the mineralogical community then, as now, were to achieve a better understanding by government, at all levels, and the public-at-large of the role of mineralogy in our everyday lives and its contribution to our economy; to strive for greater appreciation by the mineral industry of the relevance of mineralogy to their industry; and to overcome the paucity of funds available for mineralogical research, especially critical then for the new and expensive equipment coming on stream. I can even recall the hesitation of the GSC to acquire its first X-ray diffraction unit, but fortunately through the efforts of Robinson and Trail this was overcome and shortly followed by an XRF unit and other equipment, leading to the GSC's current well-equipped laboratories. I can still picture Robinson's delight in producing his first X-ray diffraction pattern (of galena, nat-

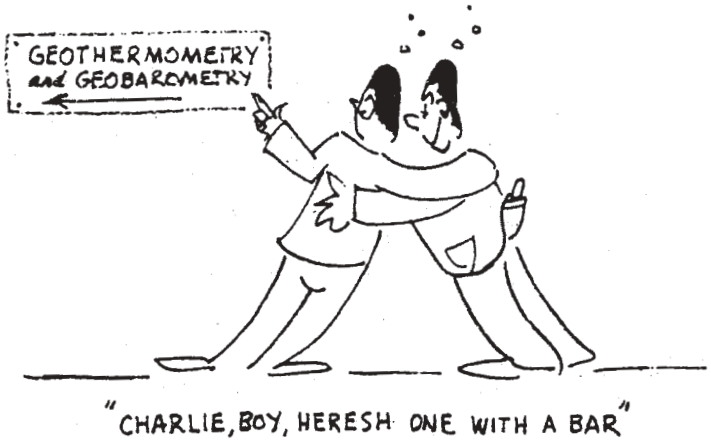




urally), a proud moment in the Survey's mineralogical history.

Understandably, my profession and experience with the mineral industry has expressed itself in my lifetime hobby – cartooning; and as may be expected many of my cartoons have a mining or mineral theme. Indeed, in the early 1980s I drew a regularly featured panel of this sort for the CIMM Reporter and also contributed a number to Geolog and various newsletters. Also, at the GSC, I would occasionally post a cartooned comment on some outlandish or unpopular proposal, such as the proposed (and aborted) move of the Precambrian section to Thunder Bay, or on administrative absurdities, or on occasion, put a humorous twist on a colleague's newest hobby or activity. I have been cartooning in one way or another for as long as I can remember and it is a hobby that has followed me through school years, university, work, and into retirement. It is difficult to say where the inspiration comes from. Perhaps it is a personality trait or a positive and humorous outlook on life, but whatever the reason I have little difficulty in coming up with ideas or putting a humorous twist to various situations or events, although as a cardinal rule I never take advantage of one's weakness or disability. I cartoon many of my greeting cards and usually add a rapid line cartoon on the envelopes of personal correspondence. For years I even added a cartoon of the beaten-taxpayer on my municipal tax-return envelopes and was astounded to learn recently that these had been saved by the treasurer and that a large, framed montage had been made of some sixteen of them. Altogether I must produce about 150 a year, mostly quick line sketches with just enough detail and colour to convey the idea. I do all this strictly for pleasure and in the hope that it will bring a little humour to the lives of others. It's a delightful hobby which, with my sleight-of-hand [*Hal is also a magician*], will hopefully keep both my mind and hands active and sharp for many years to come.

Hal is an Honourary Life Member of MAC, a Life Fellow of the MSA, a Life Member of the CIMM, a Member of the PEO, and an avid golfer. He retired from the GSC after 35 years of service.



PEOPLE BEHIND MINERAL NAMES

We continue this feature by presenting three mineral collectors who have made and continue to make important contributions to the mineral sciences.

Patrick Haynes

Haynesite - $(UO_2)_3(SeO_3)_2(OH)_2 \cdot 5H_2O$ – was named to honour its discoverer, Patrick Haynes. The description of this new mineral species was published in *The Canadian Mineralogist* in 1991:

DELIENS, M. & PIRET, P. (1991) : La haynesite, sélénite hydraté d'uranyle, nouvelle espèce minérale de la mine Repete, Comté de San Juan, Utah. *Can. Mineral.* **29,** 561- 564.

Patrick Haynes

When Patrick Haynes was 5 or 6, he received a binocular microscope from his parents, and a lifelong interest in ore minerals was born. Throughout his childhood in southern California, his father would take him to various mineral shows, where he would try to hang around from morning till evening. His parents bought him his first rock pick at age 10, and *Dana's System of Mineralogy* at age 16. When he was 15, a dealer at a mineral show challenged him to identify a specimen. Pat correctly called it "stibiconite in calcite". The dealer promptly hired him to identify the contents of his 55-gallon drums of unlabeled Mexican minerals. He graduated from the New Mexico Institute of Mining and Technology with a BS in geology in 1981. Since 1985 he has been working as a geologist

Haynesite forms amber yellow tablets and rosettes, up to 3 mm in size.

for Nielsons Inc., a construction company in Cortez, Colorado.

He has become a species collector, with a collection of about 2 800 specimens representing a little over 2 000 species. He can be seen at the Tucson show (the tall skinny guy with the cowboy hat), working at The Collectors Edge for his friend Bryan. He sells his own material at the Denver show, and he carefully plans collecting trips every year.

His curiosity and sense of observation, sharpened by all those years of looking through a microscope and wondering what that odd grain was, have paid off, as he has discovered 7 new minerals so far. He has not accomplished this by working as an exploration or mine site geologist. He found them simply by going out collecting on occasional weekends. At the 1984 Denver show, he saw some durangite from New Mexico. It looked familiar, so Pat visited a few mines where he thought he might have seen it. His "durangite" turned out to be its new sodium analog, named maxwellite. Associated with it was squawcreekite. In 1986 he found the new minerals haynesite, in Utah, and metamunirite, in Colorado. In 1989 he discovered blatonite, whose description was published in *The Canadian Mineralogist* (36, pp. 1077-1081). In the year 2000 three more new minerals found by Pat were submitted to the IMA. Two of them were approved, but are not yet published. And he has several other potential new species waiting for their time with the researchers.

He has contributed articles to *Rocks and Minerals* and he makes presentations at mineral symposiums. He also devotes 2 to 6 days annually to making geology and mineralogy presentations to schoolchildren and guiding kids on field trips to geological, mineral or fossil localities. He is a member of MAC.

Marcelle and Charles Weber

It is very fitting that a new mineral from Mont Saint-Hilaire, charmarite, has been named after Charles and Marcelle Weber. For decades, Charles and Marcelle have collected minerals from Mont Saint-Hilaire with a rare passion and dedication. The mineral that was eventually to be called charmarite $(Mn^{2+}{}_4Al_2(OH)_{12}CO_3 \cdot 3H_2O)$ was found by the Webers in 1971. It was described by George Chao in the following paper:

CHAO, G.Y. & GAULT, R.A. (1997): Quintinite-2H, quintinite-3T, charmarite-2H, charmarite-3H and caresite-3T, a new group of carbonate minerals related to the hydrotalcite-manasseite group. *Can. Mineral.* **35**, 1541-1549.

Marcelle traces her interest in rocks and minerals as far back as 1928 when her father showed her an intriguing rock from Harney's Peak in the Black Hills. She still has that sample and it carries the number 1 in her collection. That interest lay dormant for many years, until she joined the New Haven Mineral Club in 1956, and started mineral collecting. Charles started accompanying her and was soon hooked. They have become very involved in the mineral collecting community. Marcelle was the first woman president of the Friends of Mineralogy, and they were

Marcelle and Charles Weber

both inducted into the Micromounter's Hall of Fame in 1992.

They started visiting Mont Saint-Hilaire in 1968 and have missed very few of the trips to the quarry. (The quarry is open to collectors a few days per year.) Marcelle can tell you that their home in Fairfield, Connecticut, is 365.7 miles from the quarry, a six-hour drive door to door. Their Saint-Hilaire collection comprises more than 2900 micromounts and includes 200 of the 300 species found at Mont Saint-Hilaire. Marcelle even celebrated her 80th birthday in the quarry.

Marcelle, a business administrator, and Charles, a chemical engineer, retired in 1983. They have many interests besides mineral collecting. Charles enjoys gardening, home improvement, music and investments, while Marcelle has a keen interest in photography, writing and genealogy. They have been married for 59 years and have three children, seven grandchildren, and one great-grandson. They are members of MAC.

Marcelle and Charles at Mont Saint-Hilaire

MEMBER IN THE NEWS

FRANK HAWTHORNE

Dr. Frank C. Hawthorne, Distinguished Professor of Geological Sciences at the University of Manitoba, has been awarded a *Canada Research Chair* in *Crystallography and Mineralogy* by the Natural Sciences and Engineering Research Council of Canada. This provides teaching relief and significant additional research funding for seven years, and is renewable. Frank Hawthorne was born in Bristol, England, and grew up in Bristol and Maidenhead, where his principal interests were playing rugby, field hockey, cricket, and track and field. He has a B.Sc. in geology from Imperial College, London, an A.R.S.M. from the Royal School of Mines, London, and a Ph.D. in Geology from McMaster University, Hamilton, Ontario. He moved to the University of Manitoba as a postdoctoral fellow in 1973, and became a research associate in 1975 and a university research fellow in 1980. He became an associate professor in 1984 and a full professor in 1985.

Frank is widely recognized as an authority on amphiboles and other groups of complex rock-forming minerals, the topology and energetics of mineral structures, long-range and short-range order in minerals, the role of light lithophile elements in complex minerals, crystal-structure determination of minerals, and complementary analytical techniques. He has described many new minerals, interacting widely with the mineral-collecting community in the process. He is widely regarded as a seminal thinker in the areas of mineralogy and crystallography; his work addresses the widest range of topics and addresses some of the most fundamental questions on the behaviour of solid in general and minerals in particular. His current interests involve science, poetry, biography, and art, and he has been known to drink coffee.

CHRISTINE CLARK McCRACKEN

Congratulations to Christine Clark McCracken, a Ph.D. student at the University of Manitoba, who was one of the recipients of the 2001 Ludo Frevel crystallography scholarships from ICDD.

Christine Clark McCracken

I have been interested in science for as long as I can remember, spending all my free time grow- ing up roaming the forests and creeks of my hometown of Chagrin Falls, Ohio. My first exposure to geology was through my 9th grade Earth science class and I credit my teacher, Mr. William Berger, with turning me on to this field. After graduation from high school, I enrolled in the Faculty of Education at Miami University in Oxford, Ohio. My B.S.Ed. was in Secondary Education in Earth sciences. I then began a master's degree at the University of Illinois, Urbana-Champaign. Stage on a structural geology/tectonics degree project. In my final year at Illinois, Peter Burns arrived as visiting professor. I began working on a side project with him, solving the crystal structure of juabite (recently published in *The Canadian Mineralogist*) while finishing my M.Sc. degree. In 1997, I began working on my Ph.D. at the University of Manitoba under Frank Hawthorne.

My project is focused primarily on determinations of accurate site populations in tourmaline. We do not yet understand the factors affecting both chemical (Fe^{2+}/Fe^{3+} ratio, H content, Li content) and structural (long-range cation ordering, short-range coupled cation-anion ordering) aspects of tourmaline. Complex zoning is common in this group, so that microprobe techniques are required. I am using crystal-structure refinement combined with electron-microprobe analysis (EMPA) and micro-secondary-ion mass spectrometry (micro-SIMS) to analyze a suite of about 120 tourmalines to resolve these problems. I am focusing on the difficulty of cation site assignment at the two octahedral sites, coupled with the distinction of the *V* and *W* anion sites. One of the major difficulties with tourmaline is establishing a correct chemical formula. The assumption of OH + F = 4 *apfu* in tourmaline is commonly used to infer Fe^{2+}/Fe^{3+} ratios and Li content. This assumption is not universally true, and accurate measurement of the hydrogen content is required. I am measuring H and Li contents using micro-SIMS. This information will be used to determine Fe^{2+}/Fe^{3+} ratios from stoichiometric arguments. Once the correct chemical formula is known for each sample, I can then use single-crystal structure refinement to deal with the short- and long-range ordering within the mineral. Coupled with the problems of anion determination and the valence state of iron is the assignment of cations to the two octahedral sites. Mg-Fe ordering can be determined directly from the scattering intensities at the $^{[6]}Y$ and $^{[6]}Z$ sites. Ordering of Al-Mg and Fe^{2+}-Fe^{3+} is not as straightforward. Traditionally, the *Z*-site was assumed to be fully occupied with all available Al. Recent research using bond lengths to establish site occupancy curves has suggested that there is significant disorder of cations (Al-Mg) between the $^{[6]}Y$ and $^{[6]}Z$ sites. Although these are useful, they are far from accurate, and I am developing more accurate site-occupancy curves for the octahedral sites. There are additional ordering problems at the *V* and *W* anion sites, although all F is commonly thought to order at the *W* site. Verification of this, as well as short-range coupled ordering of cations and anions, is underway. The long-term implications of this work are the development of a thermodynamic model for tourmaline and a better understanding of the environment of formation of individual tourmalines and their host rocks.

MUSEUM NEWS

A NATIONAL HERITAGE AT THE CANADIAN MUSEUM OF NATURE

BY DAN SMYTHE, CANADIAN MUSEUM OF NATURE

In the early 1990s, the Canadian Museum of Nature in Ottawa concluded its purchase of William Pinch's mineral collection, considered one of the finest private collections in the world. This significant acquisition marked another step in the Museum's 150-year evolution as a national, authoritative source for mineralogy in Canada.

To understand the history of both the Museum and its collection, one needs to go back to 1842 when Sir William Logan, first director of the Geological Survey of Canada, laid the groundwork for the National Museum of Canada. For three decades, Logan inspired his staff to collect rocks and minerals, but also fossils, biological specimens and aboriginal artifacts.

Many of these specimens formed the basis for the collections and exhibits of fauna, flora and minerals housed in the Museum's historic Victoria Memorial Museum Building (VMMB), which was completed in the early 1900s. Built from local sandstone, its architecture mirrors the Centre Block of Parliament Hill, located about two kilometres due north. The VMMB even served as a temporary site for the House of Commons and the Senate following a fire on Parliament Hill in 1916.

It wasn't until 1965, when it was known as the National Museum of Natural Sciences, that the Museum hired its first curator for minerals. Louis Moyd was an exploration geologist with 20 years of field experience, and he was passionate about expanding the Museum's collection, emphasizing Canadian localities. "He knew minerals, knew what a fine specimen was," says Robert Gault, research assistant and former assistant curator, who has been with the Museum since 1970. Under Moyd's direction, the Museum increased its

Photo by Martin Lipman.

The Canadian Museum of Nature.

display items, collected from both field work and from mineral dealers. Moyd served as curator and chief of the mineral sciences division until retiring in 1981. Dr. Joel Grice replaced Moyd as curator, and under his guidance the Museum's mineral collection grew, balanced between research and display specimens. Today, Grice is a research scientist at the Museum and chairman of the Committee on New Minerals and Mineral Names of the International Mineralogical Association (IMA).

The Pinch collection, which consists of about 11,000 specimens (including about 2,000 micromounts), is the Museum's largest acquisition to date. Other smaller, but still important, collections acquired by the Museum include the Frank Ebbut collection (1961), which features display specimens from worldwide localities; the E.D. Taylor collection (1962), featuring British localities; the Robert Bell collection (1963), featuring specimens from remote Canadian areas gathered on Bell's geological expeditions; a collection from Charles Key (1970), which includes the finest covellite specimen ever recovered from the Leonard mine in Butte, Montana; and about 1,000 specimens collected by Jacques Bradley at Mont Saint-Hilaire, Quebec, including two cotype specimens of poudretteite, a cotype specimen of thornasite, and a holotype specimen of calcioburkanite.

With the Pinch collection included, the Canadian Museum of Nature now houses about 50 000 specimens of minerals, gems and rocks. Collection assistant Michel Picard manages the collection, which includes

CANADIAN MUSEUM OF NATURE RECENT FIELD RESEARCH ACTIVITIES

Near Tungsten, southeastern Northwest Territories (with UBC colleague Dr. Lee Groat)

1. Little Nahanni pegmatite group – extensive geological mapping and sampling carried out over three summers in the 1990s of a swarm of lithium-rich pegmatites.
2. O'Grady batholith – discovery and detailed geological mapping and sampling of Canada's first gem elbaite deposit (1995 and 1997)
3. Crown showing – sampling and study of Canada's first significant emerald deposit (1998)

Sussex, New Brunswick

Extensive, ongoing sampling of borate minerals from drill core of the nearby potash mines

Mont Saint-Hilaire, Quebec

Ongoing sampling of rare, peralkaline minerals from the Poudrette quarry at Mont Saint-Hilaire.

Greenland

Sampling of various alkaline complexes in south and east Greenland: Narssarssuk and Ilimaussaq (1988); Gardiner (1995); and Werner Bjerge (1998)

OUTSTANDING MINERAL SAMPLES IN THE COLLECTION

Azurite – Namibia
Cubanite – Chibougamau, Quebec
Cahnite – New Jersey (Pinch)
Covellite – Montana
Elbaite – California and Brazil
Grossular – Asbestos, Quebec
Kermesite – Zimbabwe
Lazulite – Yukon
Nambulite – Namibia (Pinch)
Neptunite – California
Rhodochrosite – South Africa
Sérandite – Mont Saint-Hilaire, Quebec
Scolecite – India
Uvarovite – Finland

SPECIAL LOCALITY SUITES REPRESENTED IN THE COLLECTION

Mont Saint-Hilaire, Quebec
Bancroft, Ontario
Rapid Creek and Big Fish River areas, Yukon
Jeffrey Mine, Asbestos, Quebec
Franklin, New Jersey (Pinch)
Langban, Sweden (Pinch)
Radioactive minerals, Dem. Republic of Congo (Pinch)
Tsumeb, Namibia

MUSEUM NEWS

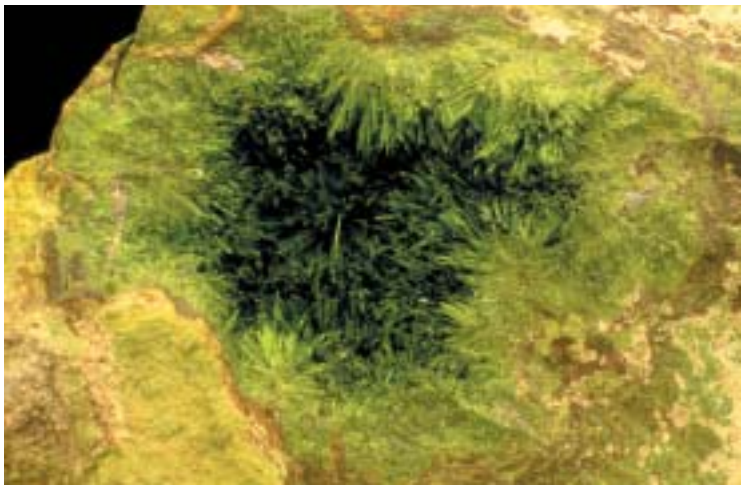
88 holotypes and 214 cotypes from Canada and around the world. Research scientist Dr. Scott Ercit, who is head of the Museum's rare elements research project, has created a new computer cataloguing program, which now holds over 22 000 specimen records, including more than 8 000 from the Pinch collection.

Examples of holotypes in the Museum's collection include moydite-(Y) (named after Louis Moyd) from the Evans Lou Mine in Quebec; varennesite from the Varennes quarry in Quebec; khomyakovite from the Poudrette quarry at Mont Saint-Hilaire, Quebec; pinchite (after William Pinch), from Terilingua, Texas, and fleischerite (after Michael Fleischer), from the Tsumeb Mine in Namibia.

Most of the collection, which is regularly visited by professional researchers as well as amateur collectors, is stored at the Museum's Natural Heritage Building in Aylmer, Quebec, across the river from Ottawa. Included are about 5 000 radioactive specimens, stored in a specially designed vault. The gem collection comprises about 2 000 specimens and contains a number of exhibit-quality gems including the 17-carat O'Donne Sapphire, formerly owned by the Grand Duchess Cyril of Russia. Other gem highlights include a 499-carat blue topaz, a 380-carat green beryl and a 34-carat emerald mounted on a gold pendant.

Photo by Steven Chamberlain

Sérandite from Mont Saint-Hilaire, Quebec. 9 cm x 4 1/2 cm x 4 1/2 cm. Pinch Collection.



Cuprosklodowskite Musonoi mine, Kolwezi, Shaba, Zaire. 6 x 6 cm. Pinch Collection.

Photo by Jeffrey A. Scovil.

With such a large collection, it is not possible to display everything. Visitors to the VMMB's Viola MacMillan Mineral Gallery can view some of the finest specimens in the collection. The gallery honours Viola MacMillan, one of Canada's first female prospectors. Her philanthropic donation in the early 1990s helped complete the fundraising to purchase William Pinch's collection. Other key donors included Teck Corp., Cominco Ltd., Barrick Gold Corp., Placer Dome Inc., Imperial Oil, Noranda Inc., Inco Ltd., Eldorado Resources Ltd. and International Corona Corp.

The gallery itself is more than just a showcase; its purpose is to inform visitors about the geological history of the Earth through the study of rocks and minerals. Visitors entering the hall view some of the rare minerals and gems in the Museum's collection; exhibits explain the difference between industrial, decorative and metallic minerals.

As visitors move further into the gallery, they enter the gallery's activity centre. Here they can explore a beachfront environment representing a zeolite locality from the Bay of Fundy or they can take a simulated trip deep into an Abitibi gold mine. The attention to detail in these exhibits is paramount. For example, the Bay of Fundy cliff face was cast from a real cliff at the site. These interactive exhibits help visitors understand how Canada's rich mineral heritage makes it one of the leading mining countries in the world.

Curating a national collection is one way in which the Canadian Museum of Nature contributes to its national mandate. The Museum also has an active research program. Museum mineralogists have recently led field expeditions to sites in New Brunswick, the Northwest Territories (with UBC colleague Dr. Lee Groat), Quebec, Yukon and Greenland (see sidebar for details). As well, the Museum offers its expertise in the analysis of minerals and other materials through its electron microprobe laboratory.

Specimens from the Museum's collection have been made available to Canadians through traveling exhibitions. The most recent, "From Crystals to Gems", highlights the world of crystals, and features a number of samples and discovery boxes. This exhibition has toured over 30 sites across Canada and will next be on display at the Elliott Lake (Ont.) Nuclear Mining Museum from May 31 to August 31.

Recently, about 120 Canadian mineral specimens from the Museum's collection (about one-quarter of which were Pinch specimens) went overseas. They were displayed in early April at the Canadian embassy in Tokyo as part of the "Think Canada 2001" festival. An estimated 20 000 visitors saw first-hand the rich mineral diversity of our country.

For more information about the Canadian Museum of Nature (including its mineral collection), visit the Web site at www.nature.ca

OBITUARY

F.F. OSBORNE

BY FRELEIGH F. OSBORNE JR.

Freleigh Fitz Osborne was born in Nogales, Arizona Territory in 1903. He was raised in Vancouver, British Columbia, and he attended the University of British Columbia, receiving a B.Sc. degree in mining engineering, in 1924, and a M.Sc. in geological engineering in 1925. He received his Ph.D. in geology from Yale University in 1928.

Following a summer with the Ontario Department of Mines, he joined the State University of Iowa as an associate professor in 1930, he became an assistant professor at McGill in the geological sciences, and in 1939, was appointed professor. During WWII, he instructed military personnel in map reading, radio mechanics and navigation. At McGill, he was chairman of the Time-table Committee in the harried post-war period expansion of McGill and the start-up of Dawson College. He also served as the McGill appointed Montreal City council representative from 1945 to 1947.

In 1947, he became professeur titulaire de Pétrologie at the Université Laval, teaching graduate and undergraduate courses and exploring his new hobby – paleontology, until his retirement in 1971.

Complementing teaching with seasonal field geology was always a big part of F.F. Osborne's life. He served with the Geological Survey of Canada (1922-1925), the Ontario Department of Mines (1928-1929) and the Quebec Department of Mines most summers from 1932 until his retirement in 1971.

He was recognized and honoured at Yale by receiving the Carol Cutler and the S.F. Emmons Memorial (economic geology) Fellowships. At Yale, he was inducted into the Sigma Xi. He was a member of the Canadian Institute of Mining, Metallurgy and Petroleum since 1920, and was a member of the Society of Economic Geologists as well as a Fellow of the Geological Society of America, joining both in 1933. He was made a fellow of the Geological Association of Canada in 1947 and was elected a Fellow of the Royal Society of Canada in 1937.

He published many scientific papers, particularly on his work in the Grenville area and that around Quebec City. He was a member of the executive of the Office de recherche scientifique Quebec from 1932 to 1948, and an associate editor of the Canadian Journal of Earth Sciences (1967-1971).

Dr. Osborne passed away suddenly in Montreal, March 13, 2000. He is survived by a son Freleigh Jr. (Hazel), grandson Don (Kate) and two great-grandchildren, all of Beaconsfield, Quebec.

OUTSIDE NEWS

A BRIEF INTRODUCTION TO THE INTERNATIONAL MINERALOGICAL ASSOCIATION

TONY NALDRETT (PRESIDENT IMA) AND TAMAS WEISZBURG, (SECRETARY IMA)

The International Mineralogical Association was founded in Madrid in 1958 with the objective of furthering international cooperation in the mineralogical sciences. This has been accomplished by organizing meetings and field excursions, sponsoring publications of mineralogical interest, establishing commissions and working groups to examine, report on and expedite a wide variety of aspects of mineralogical practice, and to collaborate with other international groups that have interests in mineralogy. Traditionally, IMA was more involved with the basic as opposed to the applied part of the science, but in 1984, IMA formed the Commission on Applied Mineralogy, which has the mandate to cover all applied aspects, including mineral beneficiation, new materials, and environmental and health aspects of mineralogy.

Organization

The members of IMA are the national scientific societies that represent mineral scientists in individual countries. There is a limited individual membership, which is open to mineralogists who reside in countries in which there is no society that can represent them. The dues that national societies pay to IMA are composed of a number of units (from 1 to 6), with larger societies being assessed more units than smaller societies.

The work of the Association is conducted by a business meeting of delegates, and by the Council. Business meetings of delegates are held as frequently as deemed necessary, with one being held at least every 4 years, traditionally during the quadrennial General Meeting of IMA. The number of votes that any national delegation is given at the Business Meeting is equal to the number of units of dues that it pays.

The Council consists of the President, First and Second Vice-Presidents, Secretary, Treasurer, the Past-President and five council members. Council members normally hold office for 4 years. The President, Treasurer, Secretary and First and Second vice-Presidents are referred to as the Officers of the Association. The first three of these form the Executive Committee. Nine commissions and five working groups conduct much of the work of the Association.

Recent Activities of IMA and Funding of these Activities

The main activity of IMA, apart from the activities of its constituent commissions and working groups, is the holding of the General Meeting every 4 years. Recent meetings include those in Stanford, California in 1986; Beijing, China in 1990; Pisa, Italy in 1994 and Toronto, Canada in 1998. Attendance usually varies between 600 and 900. Over 900 scientists attended the Pisa meeting while 680 attended the Toronto meeting. Normally the First Vice-President, who subsequently becomes President of IMA, organizes the meetings. Themes are chosen by the local organizing committees, after consulting with the commissions and working groups, to reflect recent trends in mineralogy. Because the IMA budget is very restricted, reliance is placed on the resources of the mineralogical society in the host country to provide much of the seed money and backing for the General Meeting. The host mineralogical society is also responsible for the losses/surplus incurred by the meeting. MAC kindly provided backing for the recent Toronto meeting. This meeting ended up with a surplus of about Can$120 000 after all seed money from IMA and MAC had been refunded. MAC very kindly contributed Can$25 000 to IMA from this surplus for the benefit of international mineralogists.

IMA was heavily involved in the recent (August 2000) International Geological Congress in Rio de Janeiro, Brazil. It sponsored or co-sponsored 31 sessions, ten of which were directly organized by convenors who had been approached by IMA, many at the instigation of commissions and working groups. IMA was also a co-sponsor and provided substantial backing for the meeting *Museums and Mineralogy 4* held in Melbourne, Australia in December 2000.

The 2002 Edinburgh IMA General Meeting

The next General Meeting of IMA, the 18th, will be held in Edinburgh, Scotland, from September 1st to 6th, 2002. Organization is in the hands of

OUTSIDE NEWS

the Department of Geology and Geophysics at the University of Edinburgh, and the Mineralogical Society of Great Britain and Ireland. Edinburgh is an extremely attractive and striking city, and the meeting will follow directly after the Edinburgh International Festival, the world's largest annual festival of music and the arts.

The scientific sessions will be held in the Edinburgh International Conference Centre, a state-of-the-art complex near the city centre, and will cover all branches of mineralogy, stressing their importance to adjacent branches of Earth sciences, including the human environment, geochemistry, petrology, meteoritics and petroleum reservoirs, as well as experimental work covering the surface to the Earth's core. There is a full programme of one- to five-day field excursions, mainly to classic Scottish localities, and pre- or post- meeting workshops on *in situ* microanalytical techniques, ore and environmental mineralogy and e-mineralogy – the application of computational methods to minerals. A substantial social and accompanying members programme is planned. Most participants will stay in the University's Pollock hall-of-residence. To receive the first circular or to request the second circular, due in late June, e-mail info@minersoc.org. Further information can be found at www.minersoc.org/ IMA2002. For information specifically about Edinburgh, e-mail ima2002@ed.ac.uk. The Chairman of the organizing committee is Ian Parsons.

IMA Web Page

More information about IMA can be obtained from the IMA web page (http://server.dst.unipi.it/ima/) and about the Edinburgh meeting at http://www.minersoc.org/IMA2002

Note from the editor: More on the commissions and working groups of IMA in next Newsletter

NEWS FROM THE INTERNATIONAL CENTRE FOR DIFFRACTION DATA (ICDD)

BY HELEN M. MCDONNELL

Recent ISO 9001: 1994 Certification

The International Centre for Diffraction Data (ICDD) is pleased to announce its recent ISO 9001:1994 registration. The ICDD's mission is to be the world center for quality diffraction data, meeting the needs of the technical community and to promote the application of materials characterization methods in science and technology by providing a forum for the exchange of ideas and information and through the publication of X-ray diffraction data. The ICDD aims to provide accurate high value-added services that anticipate and satisfy the expectations of our customers effectively and efficiently. We measure our progress in how well we meet the customer's needs and expectations.

Powder Diffraction available online.

All issues, current and past, of *Powder Diffraction*, a quarterly journal devoted to the use of the powder method for materials characterization, are now online via the American Institute of Physics' SPIN service. A subscription will be required to access abstracts with hyperlinked reference sections and full-text articles in PDF, PostScript, and HTML format. The table of contents and abstracts without hyperlinked references will remain available free without a subscription.

Dr. Jenkins retires

Dr. Ron Jenkins, Executive Director of the ICDD, has announced his retirement after sixteen years of service with the International Centre for Diffraction Data. Dr. Jenkins has held the position of Executive Director for the past five years. Julian Messick, Secretary and General Manager of the ICDD from 1983 to 1994, will serve as interim Executive Director.

2002 Ludo Frevel Crystallography Scholarship Award

To encourage promising graduate students to pursue crystallographically oriented research, ICDD has established the Ludo Frevel Crystallography Scholarship Fund. The ICDD has awarded thirty-nine scholarships totaling over $80,000 since the scholarship's inception in 1991. Applications for the 2002 awards must be received by the ICDD no later than 31 October 2001. For more information, consult www.icdd.com

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 mineral deposits.

Any person or organization engaged or interested in the fields of mineralogy, crystallography, petrology, geochemistry and mineral deposits can become a member.

Membership benefits include: six issues a year of *The Canadian Mineralogist*; **20% discount** on publications of the Association; special discount on registration fee at our annual meeting held jointly with the Geological Association of Canada.

Individual membership	**$90**
Institutional and corporate membership	**$340**
Sustaining membership	**$600**
Student or retired membership	**$30**

For information on membership and publications, contact our business office at

MAC
P.O. Box 78087
Meriline Postal Outlet
1460 Merivale Road
Ottawa ON
Canada K2E 1B1
Tel. and Fax: 613-226-4651

e-mail:
canmin.mac.ottawa@ sympatico.ca

Web site:
www.mineralogicalassociation.ca

President: Brian Fryer
University of Windsor, ON

Past President: Jim Nicholls
University of Calgary, AB

Vice-president: Norm Halden
University of Manitoba, MB

Secretary: Gina LeCheminant
Geological Survey of Canada, ON

Treasurer: Mati Raudsepp
University of British Columbia, BC

The MAC Newsletter is published twice a year by the Mineralogical Association of Canada as a service to its members.

Send articles for the Newsletter to:
Pierrette Tremblay
1260 de la Chaudière
Saint-Rédempteur, QC
Canada G6K 1C5
mac.amc1@sympatico.ca

Editor: Pierrette Tremblay

Contributors: Norman M. Halden, Frank Hawthorne, Patrick Haynes, Christine Clark McCracken, Helen M. McDonnell, Tony Naldrett, F.F. Osborne Jr., Jeanne B. Percival, William W. Pinch, Dan Smythe, Harold Steacy, Marcelle and Charles Weber, Tamas Weisburg

Revision: Thomas Clark, Alan Anderson

Layout: Info 1000 Mots inc.

Printer: Nicober inc.

The opinions expressed in this Newsletter are those of the authors and do not necessarily represent the views of the Mineralogical Association of Canada.

Deadline for next Newsletter:
August 1st, 2001