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PROCEEDINGS OF THE TWENTY-EIGHTH ANNUAL MEETING OF THE MINERALOGICAL ASSOCIATION OF CANADA

The twenty-eighth annual meeting of the Mineralogical Association of Canada was held on May 11-13, 1983 at the University of Victoria in Victoria, British Columbia, in conjunction with the annual meetings of the Geological Association of Canada and the Canadian Geophysical Union.

The ninth MAC short course preceded the meeting. The course was organized by D.F. Sangster and D. MacIntyre and dealt with the topic "Sediment-Hosted Stratiform Lead-Zinc Deposits". The Association sponsored or cosponsored a number of symposia and special sessions, including "Modern Advances in Geochemical Thermodynamics" organized by H.J. Greenwood, "Deep Ocean Mineral Deposits and the Cyprus Project" organized by S.D. Scott, J.H. Hall and R.L. Chase, "Applications of Lead Isotopes in Petrogenesis and Ore Genesis, and their Implications for Exploration" organized by R.I. Thorpe and J.M. Franklin, and "Stable Isotopes in the Study of Sediment-Hosted Mineralization" organized by F.J. Longstaffe and B.E. Nesbitt.

The MAC Annual Luncheon was held on May 12 in the Commons Dining Room of the University of Victoria. The Past Presidents' Medal was presented to Gabrielle Donnay in recognition of her very significant contributions to the sciences of crystallography and mineralogy. The Hawley Award for 1983 was presented to Jerry R. Weidner of the University of Maryland in recognition of his paper entitled "Iron-oxide magmas in the system Fe-C-O", which was judged to be the best paper published in Volume 20 of *The Canadian Mineralogist*.

The Annual Business Meeting of the Mineralogical Association of Canada was held on May 12 at 1700 hrs. in Room 160 of the Elliot Building, the University of Victoria, with 22 members in attendance. A.J. Naldrett opened the meeting by thanking the organizing committee of the Victoria meeting for its successful efforts on behalf of the sponsoring societies. In particular, he mentioned Chairman A. Sutherland-Brown, Vice-Chairman E. Dodson, Program Chairman C.J. Yorath, and those responsible for the MAC short course and special technical sessions. Naldrett went on to report that the Association was flourishing in respect to both its scientific activities and financial affairs. He added that R.I. Gait had recently completed a long and productive term as Subscription Manager and expressed the Association's gratitude to Bob for his efforts. A.P. Sabina presented the Treasurer's Report and referred to the audited financial statements for the 1982 fiscal year. The consolidated non-inventory assets of the Mineralogical Association of Canada amounted to $227,972 at the end of 1982 as compared with $175,048 a year earlier. Sabina reported that a new feature of the Association's financial structure is the Treasury Reserve Fund established in the fall of 1982. The principal amount in the fund, set initially at $100,000, will be reserved to deal with unforeseen financial emergencies, but interest accruing from the fund may be used at the discretion of the executive to underwrite publication costs or other "good works" consistent with the aims of the Association. L.J. Cabri reported on behalf of the Membership Committee that total membership was approximately 2250 at the end of 1982, but that this total unfortunately included a large number of delinquent members. He added that the Business Office was in the midst of computerization of the membership records and that this should streamline billing and other procedures. R.F. Martin presented the Editor's Report and stated that the journal was receiving a satisfactory number of manuscript submissions. He reported that the second number of the current volume would be the last produced by the "hot lead" linotype method and that subsequently a computer-based photo-composition technique will be used that will enhance the quality of the journal. A.J. Naldrett reported on plans for future annual meetings and short courses. The 1984 meeting will be held in London, Ontario, and will be preceded by a short course on the topic of environmental geochemistry organized by M.E. Fleet and W.S. Fyfe. The 1985 annual meeting is to be held in Fredericton, New Brunswick, where the association will sponsor a short course on transmission electron microscopy. The annual meeting will be in Ottawa in 1986, Saskatoon in 1987, St. John's in 1988 and Montreal in 1989. The minutes of the annual business meeting may be obtained from the secretary.

J.M. Duke
Secretary

PAST PRESIDENT'S MEDAL FOR 1983 TO GABRIELLE DONNAY

Fellow Mineralogists and Friends,

It gives me much pleasure to be presenting this year's Past Presidents' Medal of the Mineralogical Association of Canada to Gabrielle Donnay, known affectionately to most of us as "Gai."

The Canadian mineralogical fraternity — and sorority! — was fortunate indeed to have Gai and her respected and beloved husband José immigrate to Canada from the United States in 1970, and Canadian mineralogy has indeed been the richer for it.

Although the terms of our Past Presidents' Medal call for some "Canadian content" or Canadian connection on the part of the recipient, we are not so parochial as to take account of only the Canadian aspects of a nominee's achievements for a "new Canadian" like Gai, when assessing the nominees. Even if we were so parochial, Gai would still be a strong contender for the award because of her impressive total of about 125 puplished papers, no fewer than 50 of them having appeared since her coming to Canada in 1970!

GABRIELLE DONNAY

In addition to all these refereed papers, Gai has published innumerable abstracts and written substantial sections or chapters for several publications, including ones familiar to all crystallographers, like the *International Tables for X-ray Crystallography* and *Crystal Data Determinative Tables.*

As with most of us, many of Gai's papers have been joint efforts with various colleagues. In her case, her closest and most frequent collaborator has been and is, understandably, her devoted husband–colleague José. Indeed, Gai and José must represent one of the best examples of a wife–husband symbiotic relationship in the whole history of mineralogy! However, "symbiotic" is not quite the right word, because I believe it implies a basic interdependency whereas, despite their close interrelationship, Gai and José are very much their own persons who have each made her and his own unique contributions to mineralogy and to science.

To come to the heart of today's matter, *Gai's* contributions to mineralogy embrace a wide variety of crystallographic aspects: the solving and refining of the crystal structures of several important minerals, the application of crystal-chemical principles to interpreting the fundamental features of some important minerals, the explanation of certain physical properties of minerals in terms of their crystal structures, the elucidation of complex twins and epitactic intergrowths in widely different minerals by the use of X-ray diffraction and high-resolution electron microscopy, and the descriptions of minerals.

To give just a few specific examples of these diverse contributions, in her early pre-José days, when she was Gabrielle Hamburger, she and her Ph.D. supervisor at M.I.T., Martin Buerger, were among the first to solve the fundamental structure of tourmaline; in subsequent years, in about a dozen papers, she has elucidated further aspects of the tourmalines, including the close interdependence of composition and precise structure, and the scientifically and industrially important property of pyroelectricity.

She has, along with Rudolf Allmann, described a procedure for evaluating bond strengths in crystal structures that has been widely applied by herself and others to the clarification of the detailed structures of numerous minerals. In particular, she has collaborated with our own Bob Martin in the use of this bond-strength method to provide evidence for the existence of hydroxyl in the mantle.

In other areas of mineralogy, Gai has contributed in a fundamental way to our understanding of the ordering of transition metals in olivines, the nature of the irregular composition surface in the Iron Cross twin of pyrite, and the symmetry and twinning of diamond. She has coauthored the description of six new minerals, and she has designed X-ray and optical instruments. She has an impressive variety of interests and has made invaluable contributions to mineralogy.

Gai has had 2, or rather, 1½ new minerals named after her: *donnayite* named after both José and her, and *gaidonnayite* named after her alone. Both papers describing these minerals were published, I am glad to say, in *The Canadian Mineralogist,* the former in the 1978 number that our Association proudly dedicated to José.

Gai is a familiar figure at many of our meetings and an important contributor to the crystallographic sessions of these meetings, as we have seen at this year's meeting. A chairman can nearly always count on Gai to ask a question or make a comment in the often-embarassing pause after the conclusion of a paper. The speaker usually greets these questions or comments from Gai with a mixture of curiosity and fear. I know because I have been in such a position after having given my latest ideas on the feldspars!

I want to mention one last matter before making the actual presentation to Gai. Although a few of the awards of the mineralogical and geological organizations in North America, our own MAC, the GAC, MSA and GSA, have been made to women over the many years such awards have been given, this is one of the very rare occasions on which one of these organizations has presented a *medal* to a woman. I can say in all honesty that the fact that Gai is a woman was *not* a factor in the Committee's choice of this year's Medalist, but we are delighted that it evolved this way, and that that woman is you, Gai.

And now, it is with great pleasure and respect that I present to you, Gai, our Association's Past Presidents' Medal for your outstanding contributions to mineralogy.

Robert B. Ferguson
Past President

Mr. President, Professor Ferguson, Ladies and Gentlemen:

Thank you so much for this great honor. "Vous êtes trop indulgents" (you are too kind). This is the sentence my husband taught me, with the right pronunciation, in preparation for my first visit to his parents in Belgium, back in 1950. I must have used it many times inappropriately, since I was supposed to use it only in answer to a praising statement. Today, it applies!

The MAC is a most liberal and progressive society, since it is giving this second Past President's Medal to a woman crystallographer, who was first trained in chemistry, a profession to which she had been much attracted, but which did not welcome women into its ranks, then even less than now.

As a mineralogical crystallographer I have been very fortunate and happy in Canada and in the

Department of Geological Sciences at McGill, for which I wish to thank my colleagues. I have been treated extremely well as a member of the very small minority of women successful in the men's world of Physical Sciences. Let me use this occasion to plead for equal chances of advancement for men and women with equal qualifications: this is the only criterion that is acceptable to a professional. Don't make it harder for women to be promoted. If you do, you put a chip on their shoulder, you make them unhappy and harder to live with. Should I happen to be the first woman to be honored with a medal from a mineralogical society, let me accept it not only for myself, but for every woman geologist who deserved one in years past.

If you will now grant me a few more minutes, I would like to draw your attention to crystallographic endeavors that, in my opinion, will contribute a lot to mineralogy and petrology in the near future. As you all know, determining a crystal structure by diffraction of X rays or neutrons gives us only an *average* atomic arrangement. This limitation can lead to unacceptable simplification, as we are now learning by using the more direct technique of High Resolution Transmission Electron Microscopy (HRTEM), which yields a projection of the actual potential of a small area in a thin crystal wedge. With it, and with the proper computational precautions, we can now find out why the averaging can be misleading: a repeated twin of two low-symmetry crystals, in diffraction, can simulate a single crystal of higher symmetry, whose structure can refine to a deceivingly low residual *R*.

HRTEM can also tell stacking faults from twinning and detect incipient solid-state reactions, which may not show up at all in diffraction studies. We should routinely examine our specimen by HRTEM *before* launching any structure determination.

Now, one word of caution in the faith you may place in published crystal-structures. Very light atoms, especially hydrogen atoms, cannot be located by X-ray diffraction unless the crystallographer knows beforehand where to look for them. We know, from bond-valence summations checked by neutron diffraction, that anionic OH-for-O substitution is as frequent as cationic substitution in minerals grown in the presence of water. When we decree that an analysis, either electron-probe or wet-chemical, should be converted to a formula on the basis of an integral number of oxygen atoms per formula unit, we are making a serious mistake. Indeed, we are thus neglecting the protons that may be present and should be included in the form of OH groups (they never come any other way!). Whenever these hydroxyls lead to hydrogen-bond formation, they stabilize the crystal structure. It follows that relatively small changes in OH content can produce major effects, on the rate of a solid-state reaction for example. So, here is my second plea to you: do worry as much about the anionic OH-for-O substitution solid solution as you do about the cationic one, Al-for-Si in feldspars or Mg-for-Fe in pyroxene, for instance. It will pay off.

In conclusion let me give credit where credit is due. It was my good fortune, as an undergraduate at U.C.L.A., to be introduced to crystallography by Professor James D. McCullough, who let me help on two crystal-structure determinations, proposed to him by *his* Professor Linus Pauling. Next I wish to thank two M.I.T. professors: Martin Buerger, who supervised my dissertation on the structure of tourmaline, and Bert Warren, who gave me a taste for crystal physics. My thanks are also due to Hat Yoder, for getting me into the Geophysical Laboratory, and to Jim Thompson and Gunnar Kullerud, for many stimulating discussions early in my career. Finally, I am indebted to my good husband and coworker, J. D. H. Donnay, who first taught me crystal optics at the Johns Hopkins University and has kept my nose to the grindstone ever since.

In conclusion, let me thank my two boys, Albert and Victor, for their cheerful acceptance of an always-busy mother.

An apology is in order as the final statement of this acceptance speech: I apologize sincerely to all the speakers who, over the years from 1937-1983, have had to answer my direct, non-premeditated questions after or even during their scientific presentations. I honestly cannot suppress this impulse to find things out on the spot. I never mean to be supercilious; it is just irrepressible curiosity. Thank you for putting up with it and even rewarding the guilty so generously.

Gabrielle Donnay

THE HAWLEY AWARD FOR 1983 TO J.R. WEIDNER

The Hawley Award for 1983 is presented to Jerry R. Weidner of the University of Maryland in recognition of his paper entitled "Iron oxide magmas in the system Fe–C–O", which was judged to be the best paper published in Volume 20 of *The Canadian Mineralogist*. The system Fe–C–O may at first appear only marginally of interest to geologists, but Weidner's study indicates that magnetite can form at temperatures as low as 815°C from iron oxide melts that contain as little as 3 mole percent carbon dioxide. This is a startling conclusion indeed. Although magnetite-rich magmas have been postulated on the basis of field observations, all previous experimental studies have indicated that the existence of such magmas was precluded because geologically unreasonable temperatures were required. Weidner's experiments have demonstrated that magmas of almost pure magnetite composition could exist at temperatures well below 1000°C so long as they contain a small amount of carbon. The study involved experiments that were more difficult than those normally encountered in experimental

JERRY R. WEIDNER

petrology. Melts in this system do not quench to glasses, and their indentification must therefore be based on textural arguments. Weidner emphasizes the difficulties of interpreting the products of the experiments, but at the same time he counters each point with such care that the reader is confident of the conclusions drawn. It is not every day that geologists are presented with a new magma, and therefore Jerry Weidner's paper represents an important contribution to igneous petrology.

Jerry Weidner received his Bachelor's and Master's degrees from Miami University, and his Ph.D. from Pennsylvania State University (1968). Following his graduate studies, he served as a Research Associate, first at Stanford University and subsequently at the Goddard Space Flight Center. In 1970, Dr. Weidner joined the faculty of the Department of Geology of the University of Maryland, where he is currently Associate Professor of Geology and Director of the Geology Graduate Program. In addition to his work on the system iron–carbon–oxygen, Dr. Weidner has published papers on such topics as the mineralogy and phase relations of ferromagnesian silicates and the interpretation of lunar remote-sensing data.

Citation read by
A.J. Naldrett

Ladies and gentlemen, members of the Mineralogical Association of Canada, thank you very much for selecting me as the 1983 recipient of the Hawley Award. Indeed, I am still somewhat in a state of shock that my work should be thus recognized.

Space does not permit, nor will the editor allow, the individual acknowledgement of the many contributions made by my colleagues and friends at The Pennsylvania State University, Stanford University, Goddard Space Flight Center and the University of Maryland. Nevertheless, they have my thanks for the many discussions, arguments and suggestions made regarding my work in particular and the origin of iron ore deposits in general.

I take this opportunity to explicitly mention two people: O.F. Tuttle and J.W. Greig at The Pennsylvania State University made my study of the system Fe–C–O possible. Frank Tuttle introduced me to the petrogenetic puzzle raised by the notion of "iron ore magmas" and provided the instruction and facilities necessary for addressing the problem using the methods of experimental petrology. Joe Greig was my source of advice on a multitude of topics ranging in scope from the art of preparing polished sections to the art of deciphering J. Willard Gibbs. It is safe to say that without the inspiration, guidance and support of these two gentlemen, I would not be a recipient of the Hawley Award.

Again, ladies and gentlemen, thank you.

Jerry R. Weidner