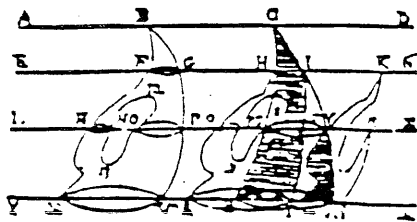


BULLETIN CSHPM / SCHPM

November / novembre 1995, #17



LEONHARD EULER



Canadian Society for History
and Philosophy of Mathematics
Société canadienne d'histoire et
de philosophie des mathématiques

ISSN 0835-5924

A message from the President

Tom Archibald

The recent federal budget cuts have had an impact on our society, and we will receive less support from SSHRC than previously. This undoubtedly means that our current modest dues will increase slightly. However, increased membership could offset this problem somewhat, it seems to me, and is desirable for other reasons. There is still no U.S. group that does what we do, and the current high interest in history there -- sure to be fanned further by the Summer Institute in History of Mathematics organized by CSHPM members Fred Rickey and Victor Katz -- could translate into members for us. An advertising campaign is planned to draw attention to the existence of our society, both in Canada and abroad. In addition, we are exploring the possibility of having some kind of link with the Canadian Mathematical Society.

One of our major efforts, the *Proceedings* of the annual meeting, will thereby reach a wider audience. Looking over past volumes, I think it is fair to say that the standards are really quite high on the whole. Some members have suggested that the *Proceedings* should be refereed, and it may be that the time has come to examine this question seriously. On the one hand, our annual meeting has traditionally been open to communications by all members, limited only by availability of time. On the

other hand, costs of publication are borne by the membership and by the taxpayers of Canada (with some help from Providence College, thanks to Jim Tattersall, the able editor), and more pages cost more money. As well, I think it is clear that most members do not wish the *Proceedings* to become a forum for cranks.

It may be appropriate to notice that an expanded membership will probably be still more predominantly English-speaking than at present. The increasingly unilingual meetings of our society, and the language of this newsletter, reflect this fact. It is a trend which other "Learned Societies" in Canada have noted as well, and which in fact seems to be international: French is less in use as a standard language of scholarly communication. But even so -- and whatever the outcome of the Quebec referendum -- the society continues to welcome francophone members, from Quebec or elsewhere, and communications in French are welcome as well.

AMS/MAA special session on history of mathematics

The AMS/MAA annual meeting in Orlando, Florida will include a special session on the history of mathematics, January 12-13, 1996. Among the speakers will be William Dunham and John Fauvel. Further details are available from Tom Archibald (address on page 9 below).

The biological turn in discussion of the development of mathematical knowledge

Robert Thomas

The pair of conferences jointly called "The Growth of Mathematical Knowledge" [see announcement on page 11] use as their title a metaphor so overworked as to be as good as dead. But it has just enough life in it to be worth exploring briefly. The body (another biological metaphor) of mathematical knowledge is taken to be something more or less alive. Three possibilities spring to mind: a plant like a tree, a system like a forest, or a whole ecosystem including atmosphere, fauna and flora, and the sustaining earth and water. The last is the only one that remotely does justice to the complexity of the world-wide multi-faceted endeavour that is mathematics, but it is of more limited usefulness than the first two for a number of reasons. One is that it is not sufficiently biological that the notion of growth makes much sense; ecosystems encompass growth rather than grow. Looked at in its full complexity, mathematics does not so much grow as change, making the notion of "progress" problematic. Michael Resnik, in his paper at the conference, admits only that "perhaps we can establish that mathematics as a whole makes progress". Looked at in its full complexity equilibration is going on just as it does in every ecosystem, and it is hard to see that the change is progressive in the simple way that "growth" suggests.

At the other extreme, plants and animals grow by imperceptible accretion, and so does mathematics most of the time. Most theorems in mathematics are proved by the person who proves them by historical accident, being available for others to prove if it is not done by their actual authors. Thus if one focuses on mathematics at the smallest scale, the addition of results as reported in *Mathematical Reviews* is analogous to cell addition in multicell organisms. This is not particularly interesting and is not significantly different from the "growth" of a heap. Something like this was characterized by Carlo Cellucci in his paper at the conference as the "closed-world view" as against the more interesting "open-world view", which is a more adequate scheme for mathematical activity in general rather than just the building up of more and more results from the same old axioms. In order to get something interesting to say, it is almost necessary to move to the middle level and think of something like a forest, if only to admit the possibility of not seeing the wood for the trees.

One reason for the usefulness of the biological metaphor is that mathematics, like life, is a process, not just a body of knowledge. At the conference, Herbert Breger quoted the statement of Hermann Weyl that "mathematics is rather an activity than a doctrine". One can of course look at

a forest as potential lumber, but a more sensitive view is of a group of independently co-existing trees of a variety of sizes and perhaps of species, actively engaged in growing as a part of living, and plainly different from a stand of dead timber. Breger pointed out (not in these words) that the body of mathematical knowledge is like the body of musical literature: it is only meaningful when brought to life in the minds of persons who understand it. In the absence of expert knowledge that allows reading it, a mathematical manuscript, like a musical manuscript, is good only for wallpaper.

The paper of Alexei Barabashev was on the "forest" scale. It focused on the long-term shift in mathematical emphasis from calculation (algorithms) to understanding (axioms) in the Hellenistic period and again at the Renaissance, and the changes in the other direction, ancient and impending. The forest analogue is the shift in dominant species with time: a forest of conifers can be replaced completely by a forest of deciduous hardwoods over time. It can be noted that a forest is not destroyed as a tree is by a forest fire. Compost/topsoil is the basis for everything in the forest; the mathematical analogue is set theory, whose recent development was the subject of Penelope Maddy's paper. If one explores the forest metaphor, one notices that an analogue for the trees is the separate theories that have the same axioms and styles of inference. When a seed sprouts, one does not know whether it will be a great tree or a piece of underbrush. The seedling may be something that is very

close to trees that are already there or something at or beyond the edge of the forest, breaking new ground as we say. This picture captures the spread of the forest as well as its ever-increasing density. But it is easy to think of the trees themselves instead of the growth of the forest by increase of density, spreading, and accretion (not seeing the wood for the trees). As Whorf claimed with his contrasting Hopi language, we are almost locked into thinking about things at the expense of processes.

I conclude by shifting from a focus on the metaphor to a direct look at the processes. As among philosophers, so among mathematicians: there is little interest in the proof of one more theorem from the same old hypotheses. What mathematicians value is the breaking of new ground, as I called it above -- at least when this is done with an admirable plant, that is, with the invention of a new theory, or of a new method of proof, or of a new proof of something already known to be true. This last is obviously the use of a proof method in a new way. One takes credit of course for proving a new theorem, but greater interest does seem to be taken in the other three kinds of novelty, in new axioms, methods and proofs. This bears out Breger's emphasis on progress of this kind rather than on growth, which involves factual knowledge, since all three add to know-how more than they add to factual knowledge (axioms being not facts but the way to mathematize something not mathematized

(continued on page 12)

History of mathematics on the World Wide Web

The following article will appear in the newsletter of our sister organization, the British Society for the History of Mathematics; it is printed here with permission.

John Fauvel

At the recent Edinburgh conference on Scotland's mathematical heritage, Edmund Robertson gave a talk with the above title, describing the history-of-mathematics archive which he and John O'Connor provide as part of their "Mathematical MacTutor" software. This now has some 1000 biographies of past mathematicians -- 200 fuller biographies with portraits and some 800 shorter biographies. In addition there are 20 articles on topics in the history of mathematics, and a variety of further facilities, including a listing of mathematicians who were born, or who died, on the day one accesses the archive; a birthplace map; search facilities and an interlinking of names; and miscellaneous material. In principle this facility meets a considerable and growing need, a hunger for information about the history of mathematics. The need is attested by the large number of people who consult it over the Internet -- some 3000 make contact each day, and can download its information, including the scanned portraits, into their own machines. Because of the web-like nature of the Web, inquirers will not always

realise that it is the St Andrews archive they are accessing, since it can be reached through other institutions also -- for example, engaging with history of mathematics through the Library of Congress home page leads the surfer to the St Andrews material.

This archive clearly has the potential to be widely useful, and widely influential. It is just the sort of thing that will be consulted by students of the history of mathematics throughout the world in preparing essays and projects. The quality of the material which is taking such a high profile on the Internet is therefore of considerable importance to the history-of-mathematics community. At the Edinburgh meeting there was not time for discussion of the St Andrews initiative, so this column is acting as a medium for raising issues of concern to, and raised by, members of that community. It follows on too from the discussion started in [BSHM] *Newsletter* #28 (Spring 1995) by Reinhard Laubenbacher and Steve Russ. In each of their articles, Reinhard and Steve stressed the issue of scholarly standards and quality as a foremost consideration in evaluating material placed on the Internet -- and noted that this is of especial importance in the history of mathematics.

What does the lay surfer experience when browsing on the net and accessing the St

Andrews material? In some respects the message is a welcoming and positive one: the history of mathematics is seen to be a rich subject, a subject in which many people have been involved and for which a lot of information may be gathered and provided. But such an accumulation of material also gives a strong message about what constitutes history, and will necessarily convey in its style and presentation its compilers' conception and understanding of history. Here, the impression is overwhelmingly given that the history of mathematics consists of a succession of ill-written sentences of factual information strung along in a random order, unsupported by evidence and of unknown significance.

What, for example, does the surfer find who comes to the entry on Thomas Muir?

Important in the theory of determinants where he made important historical studies. Several names were coined by Muir to attach particular mathematicians to work with which they have been involved.

This is it, *in toto* -- even for a short biography, this is pretty uninformative! Particularly since most people who consult this archive will be doing so *because of* Muir's work on the history of determinants -- and, as usual in this archive, no guidance is given either on the source of the compilers' information, nor where to go to find out more about Muir. And the second sentence in that account barely rises to the standards of literacy which would certainly have been required of a Scottish dominie of the old school!

The longer biographies are not necessarily an improvement -- indeed, if anything they offer more scope for things to go wrong! Here, for example, is the entry on James Joseph Sylvester:

James Joseph Sylvester
Sept 3 1814 - March 15 1897
Born and died in London, England.

Sylvester did important work on matrix theory. In 1851 Sylvester discovered the discriminant of a cubic equation and first used the name "discriminant" for equations of higher order.

Sylvester was a student at Cambridge from 1831 but being Jewish he refused to take the religious oath necessary to graduate. From 1838 he taught for three years at the University of London. His former teacher De Morgan was one of his colleagues.

At the age of 37 he was appointed to a chair in the University of Virginia, but he resigned after a few months. A student who had been reading a newspaper in one of Sylvester's lectures insulted him and Sylvester struck him with a sword stick. The student collapsed in shock and Sylvester believed (wrongly) that he had killed him. He then worked as an actuary and lawyer for 10 years but gave mathematics tuition. His pupils included Florence Nightingale. Here is an account of Sylvester by a fellow mathematician, in 1859.

"On Monday having received a letter from Sylvester I went to see him at the Athenaeum Club. ... He was, moreover, excessively friendly, wished we lived together, asked me to live with him at Woolwich and so forth. In short he was eccentrically affectionate."

In 1877 Sylvester accepted a chair at Johns Hopkins University and founded in 1878 the American Journal of Mathematics, the first mathematical journal in the USA.

Sylvester did important work on matrix theory. In 1851 Sylvester discovered the discriminant of a cubic equation and first used the name "discriminant" for

such expressions of quadratic equations and those of higher order.

In particular he used matrix theory to study higher dimensional geometry. He also contributed to the creation of the theory of elementary divisors of lambda matrices.

Sylvester sent the following puzzle to the Educational Times. It tells us of one of his hobbies as well as his interest in puzzles:

"I have a large number of stamps to the value of 5d and 17d only. What is the largest denomination which I cannot make up with a combination of these two different values?"

(The answer is 63d. Can you prove this?)

Much of the information here is correct -- though repeating it twice hardly makes it twice as plausible! -- but given in a seemingly random order. One rather fears for the impression this leaves of what historical writing should look like -- the student who uses this text as a model may receive an unpleasant surprise when the teacher comes to grade the work. When students rely so much on learning from examples of good practice it is rather challenging to confront them with examples of texts with no visible coherence or editorial judgment. Nor is it clear that the pieces of information which are given are just those that would give the most helpful impression of Sylvester's life and work in the space available.

The authors have defended their work on the grounds that it is, on the whole, factually correct, but that isn't the point. The point is the *selection* of the facts and to

what end. The strange quotation which appears to no visible purpose in the middle of this entry (unattributed, but in fact from the diary of T.A. Hirst) is the remnant of an excruciatingly adolescent sexual innuendo which appeared in an earlier version (thankfully removed after an intervention a couple of months ago). The factual omissions in this entry are equally surprising. No mention of Sylvester's great friend Cayley? No discussion of what he was doing at Woolwich? No mention that he returned to England to take up the Savilian chair at Oxford in 1883? This would not matter so much were it not for the omission, as usual in this archive, of any guidance either on the source of the compliers' information, or where to go to find out more about Sylvester.

The way the St Andrews archive came about may explain something of its present state and quality. It is apparently a side-product of the broader "Mathematical MacTutor" project from St Andrews, which helps support the teaching of mathematics at university level and which has justly received high praise and widespread plaudits. The authors developed some historical notes as an adjunct to this which are here collected in a single "archive". Apparently the issue of historical quality did not figure highly at this stage -- Edmund Robertson somewhat surprisingly defended or sought excusal for any shortcomings by saying these accounts were "designed for undergraduate consumption". But what passes, or at least is overlooked, in the margin of a consenting relation between students and their teachers at the far end of

Fife takes on a very different aspect when available to surfers from Iceland to Papua New Guinea, who may trust in the St Andrews name as a certificate of quality assurance that they can believe what they read on their Internet, and are relying on the entries to show them the way, as paradigms of how to write history.

They *should* know better, of course. As Reinhard Laubenbacher and Steve Russ make clear, the ground rules for Internet users *have to* have a large measure of "caveat emptor"; but *how* are buyers to beware? *How* can someone in deepest Venezuela, trying to find some information to share with pupils later that morning, discover that the account of Sylvester (or any of 999 others) is unpredictably inadequate and misleading? Those who care about the history of mathematics, and believe it to be potentially a force for understanding and good, may care to ponder how the Internet can be helped to act as an empowering agent throughout the world, not as a device for disseminating rubbish, as it were some kind of bitterly ironic throwback to the colonizing activities which have brought so much wealth to Scotland in earlier centuries. The situation is not unique to history of mathematics, of course. Will Hutton wrote in a recent *Guardian* (18 September, p. 10) that "Some of the information on the Internet is second-rate, garnered by people who could not pass the scrutiny of publishers and editors. This is at once its source of strength, liberating the individual from the tyranny of social, political and editorial control, and its weakness. Much of this material badly

needs to be edited; and the surfer has no guarantee of its accuracy or probity". What we find on the St Andrews archive, then, is but a microcosm of a much wider problem -- but nonetheless this problem is *our* problem.

One thing is clear, that the existence of this archive should lead teachers of the history of mathematics across the world to be more solicitous than ever of teaching their students discrimination and active critical judgment. The old warnings about not believing things just because you read them somewhere, and taking great care to examine the grounds on which it is reasonable to accept what is being claimed, must be proclaimed more loudly than ever. All the same, such warnings will not travel far outside the history-of-mathematics community. The rest of the world is still vulnerable to infection, like Europeans bringing measles.

In his talk to the Edinburgh meeting, Edmund Robertson invited corrections, and indeed provided assurances that a rewritten entry would appear as a signed contribution. If enough scholars are able to help in this way, the quality will rise and in the fullness of time an archive of real value will emerge. In the meantime, or halfway through this process, the archive will consist of an unpredictable mixture of, on the one hand, informative articles written by scholars of repute, and on the other, unbalanced and ill-edited tosh, anonymous and unsourced. Some generous and altruistic members of the BSHM have already started to write fresh articles, over their own names, to help

work toward the ideal archive which we can all envisage. It is up to us all as a community to ensure (either by writing, or by supportive critical feedback) that articles in the archive reflect the highest professional standards of current scholarship. In so doing we will be providing an example which communities throughout the world will find of value and help. The many scholars whose endeavours have built up the reputation of the University of St Andrews over more than five centuries will then be able to stop shaking their heads in bewilderment that this reputation can have been put in jeopardy so lightly and unthinkingly.

MacTutor History of Mathematics can be accessed on the World Wide Web at <http://www-groups.dcs.st-and.ac.uk/~history/>.

CSHPM members interested in participating in the revision of the archive should contact Tom Archibald, Department of Mathematics and Statistics, Acadia University, Wolfville, N.S. (Canada), B0P 1X0, tom.archibald@acadiau.ca, indicating which article they would like to work on, or they can contact directly Steve Russ, Department of Computer Science, University of Warwick, Warwick CV4 7AZ, England.

The British Society for the History of Mathematics welcomes new members, at 12 pounds per year. Anyone who is interested should contact the membership secretary, J. Helen Gardner, 25 Hollow Croft Road, Willenhall, West Midlands, WV12 SYS, England.

New Society pamphlet

Included with this issue of the *Bulletin* is a new pamphlet, designed by Glen Van Brummelen, which describes and advertises the CSHPM. Please show it to potentially interested colleagues and/or post it in an appropriate place such as your department's notice board. If you know of a potential member who might benefit from receiving his or her own copy, please pass that person's name and address to Glen at The King's University College, 9125 - 50 St., Edmonton, AB (Canada), T6B 2H3, gvanbrum@kingsu.ab.ca. At present the pamphlet exists only in English, but a French version is under development.

Request for syllabi

In connection with the Summer Institute on History of Mathematics that has been run in Washington by Fred Rickey, Victor Katz and others, an attempt is being made to establish a collection of syllabi of history-of-mathematics courses. Any syllabus, description, reading list or the like for such a course, or for any mathematics course with an historical component, would be a valuable addition to this collection. Please send all submissions to Tom Archibald, Department of Mathematics and Statistics, Acadia University, Wolfville, N.S. (Canada), B0P 1X0, tom.archibald@acadiau.ca. Anyone who is using Pegasus Mail can append documents in Word, Word Perfect or Text format.

Victor Katz, Israel Kleiner winners of awards

Two longtime members of the CSHPM have recently won distinguished awards.

Victor Katz, of the University of the District of Columbia in Washington, was awarded the Watson Davis Prize of the History of Science Society for his book *A History of Mathematics: an Introduction* (Harper Collins). The award is for the best recent expository or introductory-level book in the history of science.

Israel Kleiner of York University in Toronto was awarded the Lester R. Ford Prize by the Mathematical Association of America for the article (written jointly with N. Movshovitz-Hadar) "The role of paradoxes in the evolution of mathematics", *American Mathematical Monthly* 101 (1994), 963-74.

Congratulations, Israel and Victor!

Directory of historians of mathematics ready

The *World Directory of Historians of Mathematics*, edited by Kirsti Andersen and Mette Dybdahl, has just appeared. The cost is \$8 (U.S.) for residents of Europe, \$10 for others (postage included). Specify whether you want a disk or a printed copy; the cost for *both* is \$12/\$15.

To order, send the appropriate amount to the account of the treasurer of the ICHM,

Prof. Menso Folkerts, Stadtsparkasse München, Haidhauser Strasse 1, D-81675 München, Germany (account # 28-267953, bank code # 701 500 00, key word "World Directory"). Then send your name and address, with the particulars of your order and an assurance that you have remitted the appropriate funds, to Prof. Menso Folkerts, Institut für Geschichte der Naturwissenschaften, Ludwig-Maximilians-Universität München, Museumsinsel, Postfach, D-80306 München, Germany.

E-mail discussion group in history of mathematics

Fred Rickey has set up an unmoderated e-mail group for people with a "serious" interest in the history of mathematics. It deals with all aspects of the subject, including announcements of meetings; information on new books and interesting journal articles; the teaching of the history of mathematics, and the use of history in the classroom; questions unsettled in the literature; any other relevant questions that people may have, and (hopefully) answers that others can provide. To join, send to majordomo@maa.org an e-mail message consisting of the single line "subscribe math-history-list" (without the quotes, of course), and within moments you will receive from "majordomo" a message confirming that you have been added to the list. Note that you do *not* include your name in the sign-up message. The group is managed by V. Frederick Rickey (rickey@math.bgsu.edu).

Penn State sponsoring conferences of interest

Pennsylvania State University is sponsoring a pair of conferences on "philosophy and history" of mathematics, called "The Growth of Mathematical Knowledge". There is a reason for citing philosophy and history in that order. At the first conference, held in April 1995, all the papers were given by philosophers: Alexei Barabashev (Russia), Hourya Benis-Sinaceur (France), Herbert Breger (Germany), Carlo Cellucci (Italy), Donald Gillies (England), Emily Grosholz (USA), Michael Liston (USA), Klaus Mainzer (Germany), Penelope Maddy (USA), Colin McLarty (USA), Volker Peckhaus (Germany), Carl Posy (USA), Michael Resnik (USA), Mark Steiner (Israel), Christian Thiel (Germany), Mark Wilson (USA). But the selection of speakers for the conferences sought not only to involve scholars from many nations but to include historians as well as philosophers. This latter aim will be achieved by the second conference, to which have been invited some historically minded philosophers and some historians (including some members of the CSHPM): Isabella Bashmakova (Russia), Michel Blay (France), Henk Bos (Netherlands), Sergei Demidov (Russia), François Duchesneau (Canada), Michel Fichant (France), Craig Fraser (Canada), Eberhard Knobloch (Germany), Detlef Laugwitz (Germany), Michael Mahoney (USA), Paolo Mancosu (USA), Kenneth Manders (USA), Madeline Muntersbjorn (USA), Fritz Nagel (Switzerland), Karin

Reich (Germany), Boris Rosenfeld (USA), Ivo Schneider (Germany). The philosophers' papers will be circulated among the historians, who (it is intended) will use their specialized knowledge as a test of the philosophers' views. The proceedings should be published eventually in book form.

The second conference will take place April 26-29, 1996 and may be of interest to some members of the CSHPM, many of whom live within reasonable travelling distance of Penn State. For further details, write to Prof. Emily Grosholz, Department of Philosophy, Pennsylvania State University, University Park, PA 16802-5201.

New CSHPM home page on World Wide Web

The CSHPM/SCHPM home page on the World Wide Web, developed by Glen Van Brummelen, is now operational. Here one may find information about the Society, about its annual meetings, and about its publications. Also, a collection of links to other relevant sites is provided. Indeed, this home page is intended to serve as a starting-place for the finding of other Web sites in our field. The address is <http://www.kingsu.ab.ca/~glen/cshpm/home.htm>. If you wish a link to your own home page to be included, or to suggest other sites to which links should be provided, please contact Glen at The King's University College, 9125 - 50 St., Edmonton, AB (Canada), T6B 2H3, gvanbrum@kingsu.ab.ca.

From the editor

Hardy Grant

In a rash moment at the Montreal meeting last June I agreed to undertake the editorship of this, the CSHPM newsletter. Regular publication had ceased in April 1992, after 16 numbers that appeared roughly every six months (spring and fall), so the present issue represents something of a resurrection.

In its previous incarnation the Bulletin described itself as "an informal medium whose aim is to inform members of the CSHPM/SCHPM, and others interested in the history and philosophy of mathematics, of happenings, meetings, current research work, publications etc. and to provide a place where one can present tidbits, historical problems, quotations etc. which do not find a place in more formal media". To this still useful summary I can add only a few further points. As space permits, the intellectual content of the newsletter will be raised by articles of substance, such as that by Robert Thomas in this issue. An interesting feature in the past, which I hope to revive, was a series of profiles, variously biographical and autobiographical, of individual members. If you wish to volunteer anyone (including possibly yourself) for this kind of spotlight, please let me know. I hope also to run an "Items of Interest" column which would collect shorter reports on individuals' professional activities plus such personal news as may be of general interest. Manifestly, the flourishing of all these features will depend

critically on people's willingness to contribute. Il va sans dire que les pages du *Bulletin* sont chaleureusement ouvertes aux textes soumis en français.

A resurrection, though it looks with profit to the past, is an opportunity for a fresh start. This first issue of the new series, this phoenix which you hold in your hand, is only a trial version, offered as a basis for improvement. I shall welcome gratefully suggestions and comments about any aspect of the newsletter — content, format, typography, whatever. Please send them all, and all other submissions, to me at 539 Highland Avenue, Ottawa, Ontario, K2A 2J8 (Canada), bt706@freenet.carleton.ca.

Subscription reminder

Members are respectfully reminded that the January mailing of *Philosophia Mathematica* goes only to those who have already paid, and the need to deal separately with the tardy is a considerable inconvenience.

The biological turn ...

(continued from page 4)

before). In their discussion of what happens in mathematics, it may be that the philosophers were inhibited more by the conference title's "knowledge" than by its metaphor of "growth".

*Department of Applied Mathematics
University of Manitoba
Winnipeg, Man. R3T 2N2 (Canada)
thomas@cc.umanitoba.ca*