

NEWSLETTER / BULLETIN

APRIL 1995

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AVRIL 1995

**The NEWSLETTER is a publication of the
Canadian Mathematics Education Study
Group**

**Ce BULLETIN est une publication du
Groupe canadien d'étude en didactique
des mathématiques**

CMESG is a group of mathematicians and mathematics educators who meet annually to discuss mathematics education issues at all levels of learning. The aims of the Study Group are:

- 1) to study the theories and practices of the teaching of mathematics;
- 2) to promote research in mathematics education;
- 3) to exchange ideas and information about all aspects of mathematics education in Canada;
- 4) to disseminate the results of its work.

Le GCEDM est composé de personnes oeuvrant en mathématiques et en didactique des mathématiques et qui se réunissent une fois par année pour étudier diverses questions relatives à l'enseignement des mathématiques à tous les niveaux. Les buts du Groupe sont les suivants:

- 1) susciter une réflexion critique sur la théorie et la pratique de l'enseignement des mathématiques;
- 2) encourager la recherche en didactique des mathématiques;
- 3) faciliter l'échange d'idées et d'information sur tous les aspects de la didactique des mathématiques au Canada;
- 4) faire connaître les résultats de ses travaux.

President's Message

Travels in the UK and Portugal (I'm in Oxford as I write this) have brought home to me the universality of many of the issues and problems facing mathematics educators. Universities, schools and colleges in the UK are facing large financial cutbacks and challenges from government, business and industry, and parents to do more with less and to do it better, whatever 'it' might be. Accountability in terms of research productivity is a critical issue among UK universities with a classical Darwinian approach being taken to determine which programs and departments will survive and which will be funded. Portugal, on the other hand, is struggling to establish a mathematics education community. A major challenge for them is for all those with an interest in mathematics education to create pathways for communication. Only recently (1990) have they formed the Mathematics Teachers Association of Portugal.

In Canada, of course, we have an embarrassment of riches in terms of vehicles through which to talk about issues and problems in mathematics education, and this year is even more exceptional. Starting in early May, there are four conferences and a Mathematics Olympiad taking place in one six week period (and particularly between May 26th and June 8th) which will address research issues and research projects in mathematics education; relationships among business, industry, government and the mathematics education community; issues surrounding the reform of the teaching of mathematics from kindergarten to university level mathematics; and issues about the nature of mathematics curricula again spanning the spectrum from kindergarten to university.

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**Compte rendu de la 18e Assemblé générale annuelle
Groupe canadien d'étude en didactique des mathématiques
Université de Regina, 4 juin 1994**

1. *Remarques préliminaires* –Sandy Dawson
 - a. Sandy fait d'abord lecture du texte à la mémoire de Nicolas Herscovics publié dans le numéro d'avril 1994 du BULLETIN du GCEDM, après quoi une minute de silence est observé.
 - b. Il adresse des remerciements à Mary Crowley, Bernard Hodgson, Carolyn Kieran et Pat Rogers pour leur travail au sein du Comité exécutif.
 - c. Il remercie Eric Muller pour avoir accepté la responsabilité du BULLETIN du GCEDM d'avril 1994 en plus de son travail de secrétaire-trésorier.
 - d. Il remercie Vi Maeers pour tout le travail accompli en préparation de cette rencontre. Le tout baigne dans l'huile et la nourriture est délicieuse.
 - e. Il remercie Martyn Quigley pour la publication des *Actes* de la rencontre de 1993 et pour avoir accepté d'être éditeur des *Actes* de 1994.
 2. Le compte rendu de la rencontre de 1993 est approuvé.
 3. *Rapport du secrétaire- trésorier* – Eric Muller
 - a. Le GCEDM a reçu un don de 20 000\$ suite au succès financier d'ICME-7 (voir le BULLETIN du GCEDM d'avril 1994). Cet argent a été placé sous forme de certificats de placement garantis et l'Exécutif serait heureux de recevoir les suggestions des membres quant à l'utilisation (i) du capital et (ii) des intérêts.
 - b. Le GCEDM est en bonne santé financière. Plus de la moitié des revenus annuels du Groupe provient du CRSH.
 - c. Le GCEDM a de nouveau reçu une subvention du CRSH pour la rencontre annuelle de 1994.
- contenu des messages et les membres n'y seront pas automatiquement inscrits.
4. Les amendements aux Statuts, tels que publiés dans le BULLETIN d'avril 1994, sont approuvés. Conséquemment, le Comité consultatif est aboli.
 5. *Rapport du président* – Sandy Dawson
 - a. Sandy fait lecture de lettres de la Société mathématique du Canada invitant le GCEDM à déléguer un représentant au sein de deux de ses comités, à savoir le Comité d'éducation et le Comité des affaires internationales. L'Exécutif a accepté ces invitations. Certaines craintes sont exprimées quant aux coûts que pourront entraîner ces représentations. Des membres du GCEDM font actuellement partie du Comité d'éducation, et lorsque cela ne sera pas le cas, l'Exécutif pourra choisir un membre du Comité comme représentant. La représentation au sein du Comité des affaires internationales apparait essentielle si le GCEDM veut avoir son mot à dire dans le choix du représentant canadien à la CIEM.
 - b. Sandy décrit brièvement le Forum canadien sur l'enseignement des mathématiques qui se tiendra à Québec du 5 au 7 mai 1995. La participation est sur invitation seulement. Il prévoit présenter plus d'informations sur le Forum dans le prochain numéro du BULLETIN.
 - c. Sandy indique que le nom de Roberta Mura a malencontreusement été omis, dans les *Actes* de 1993, du rapport du Groupe de travail dont elle était coresponsable. L'Exécutif enverra des pages corrigées avec le prochain numéro du BULLETIN.*

(suite à la page 4)

* Les pages corrigées sont incluses avec ce numéro du BULLETIN.

Minutes of the 18th Annual General Meeting
Canadian Mathematics Education Study Group
University of Regina, 4 June 1994

1. *Introductory remarks* – Sandy Dawson
 - a. Sandy read the *In Memoriam – Nicholas Herscovics* as it appeared in the April 1994 CMESG NEWSLETTER. A minute's silence was observed.
 - b. He extended a word of thanks to Mary Crowley, Bernard Hodgson, Carolyn Kieran and Pat Rogers for their work on the Executive.
 - c. He thanked Eric Muller for undertaking the April CMESG NEWSLETTER over and above his work as Secretary/Treasurer.
 - d. He thanked Vi Maeers for all the work she had done to prepare for this meeting. The meeting was running very smoothly and the food was delicious.
 - e. He thanked Martyn Quigley for completing the *Proceedings* of the 1993 meeting and for his willingness to edit the 1994 *Proceedings*.
2. The minutes of the 1993 AGM were approved.
3. *Treasurer's report* – Eric Muller
 - a. CMESG had received \$20 000 as a result of the financial success of ICME-7 (see April NEWSLETTER). This money has been invested in GICs and the Executive would be pleased to receive suggestions from the members as to what should be done with (i) the capital and (ii) the interest.
 - b. CMESG is in a good financial position. More than half of the Group's annual revenues come from SSHRC.
 - c. CMESG was again successful in obtaining an SSHRC grant for its 1994 meeting.
4. The Constitutional Amendment published in the April 1994 NEWSLETTER was approved. There will no longer be an Advisory Board.
5. *President's report* – Sandy Dawson
 - a. Sandy read letters from the CMS inviting CMESG to have a representative on two of its committees, namely the Education Committee and the International Affairs Committee. The Executive has responded positively to this invitation. Concern was expressed about the cost of having such representation. At present CMESG already has elected members on the Education Committee and at times when this does not occur the Executive may choose someone else on the Committee to represent CMESG. Representation on the International Affairs is essential if CMESG is to have some say as to the Canadian representative on ICMI.
 - b. Sandy spoke briefly about the Forum for Mathematics Education which is to be held in Quebec City May 5-7 1995. Participation is by invitation only. He was planning to present more details about the Forum in the next NEWSLETTER.
 - c. Sandy indicated that unfortunately Roberta Mura's name had been left out of the 1993 Proceedings in the Working Group of which she was co-leader. The Executive will be sending out corrected pages with the next NEWSLETTER.*
6. *ICME-8* – Bernard Hodgson

Bernard indicated that there was still time for input to the ICME-8 Program Committee, individuals could either contact him or e-mail the Congress at icme8@obelix.cica.es.

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* The corrected pages are included with this issue of the NEWSLETTER

Compte rendu (suite de la page 2)

6. ICME-8 – Bernard Hodgson

Bernard rappelle qu'il est encore temps de faire des suggestions au Comité du programme d'ICME-8, soit en le contactant personnellement, soit en écrivant au Secrétariat du Congrès à l'adresse icme8@obelix.cica.es.

7. Rencontres futures

1995: à London, la rencontre débutant le 26 ou le 27 mai. Doug Edge est l'organisateur local.

1996: cette rencontre devrait se tenir dans les Maritimes.

1997, etc.: l'Exécutif a reçu deux invitations pour les rencontres futures. Si le cycle des sites devait se poursuivre, la prochaine rencontre se tiendrait au centre du Canada.

8. Élections – Lesley Lee, David Wheeler et Carolyn Kieran

Bernard Hodgson et Patricia Rogers sont élus pour un mandat de deux ans au sein du Comité exécutif.

9. La séance est levée après diverses annonces de membres à l'intention des participants présents.

Eric Muller, secrétaire

Avis d'élections Comité exécutif 1995

Juste un rappel qu'il y a cette année **deux** postes à combler au sein du Comité exécutif. Un bulletin de vote est inclus dans le présent envoi. Vous pouvez voter soit en remettant votre bulletin *en main propre* à Pat Rogers avant l'Assemblée générale lors de la rencontre du GCDEM de mai prochain, soit *par courrier* en faisant parvenir votre bulletin à Pat, *avant le 12 mai*, à l'adresse figurant sur le bulletin de vote. Si vous votez par courrier, prière **d'inscrire votre nom sur l'enveloppe** afin de valider votre vote.

Pat Rogers
Lars Jansson

Minutes (continued from page 3)

7. Future meetings

1995: in London starting May 26 or 27. Doug Edge is the local organizer.

1996: it is anticipated that this meeting will be in the Maritimes.

1997 and on: the Executive has received two invitations for future meetings, if the cycle of locations is followed the next meeting would be in central Canada.

8. Election results – Lesley Lee, David Wheeler, and Carolyn Kieran

Bernard Hodgson and Patricia Rogers were elected for a two year term

9. The meeting was adjourned after a number of members made announcements which could be of interest to participants.

Eric Muller, Secretary

Notice of Elections Executive Committee 1995

Just a reminder that **two** elected positions on the Executive Committee must be filled this year. Included with this NEWSLETTER is a voting form. You can *vote in person* by handing your vote to Pat Rogers prior to the General Meeting during the CMESG meeting next May or you can *vote by mail*, by sending your voting form to the address shown on the form to reach Pat before May 12. If you choose to vote by mail, please remember to **print your name on the envelope** to validate your vote.

Pat Rogers
Lars Jansson

La Bourse commémorative Nicolas-Herscovics

Le Professeur Nicolas Herscovics a fait un legs à l'Université Concordia en vue de la création d'une bourse de 2e et 3e cycles en didactique des mathématiques. L'Université a maintenant créé la *Bourse commémorative Nicolas-Herscovics* qui sera remise annuellement à une personne inscrite au programme de Maîtrise en enseignement des mathématiques de Concordia.

Tous les amis, collègues, étudiants ou collaborateurs de Nick souhaitant contribuer à ce fonds peuvent faire parvenir un chèque, émis à

l'ordre de l'Université Concordia (Bourse commémorative N.-Herscovics), à l'adresse suivante:

Dons en capital
Université Concordia
1455 boul. de Maisonneuve ouest
Montréal, QC H3G 1M8

Les dons sont déductibles d'impôts et des reçus seront émis par l'Université.

The Nicolas Herscovics Memorial Fellowship

Professor Herscovics left a bequest to Concordia University to set up a graduate fellowship in Mathematics Education. The university has now established the *Nicolas Herscovics Memorial Fellowship* and an award will be made annually to a student enrolled in the Master in the Teaching of Mathematics programme at Concordia.

Friends, colleagues, students, and collaborators of Nick who would like to contribute to the Fellowship can do so by sending a cheque made to the order

of Concordia University (N. Herscovics Memorial Fellowship). The mailing address is:

Capital Gifts
Concordia University
1455 de Maisonneuve Blvd. W.
Montréal, Québec H3G 1M8

Contributions are tax-exempt. Receipts will be issued by the university.

President (continued from page 1)

The Canadian Forum for Education in Mathematics occurs in Québec City over the May 5-7 weekend. This Forum received financial support and involves representatives from business, industry, government and the mathematics education community. Then on the 26th of May, Doug Edge will be welcoming us to London and his university for our annual meeting, information about which is provided with this NEWSLETTER. A drive from London to Montréal after the CMESG/GCEDM meeting places one in the position of being able to attend the CSSE meetings as part of the Learned. Finally, a quick trip back to Toronto and one could attend the CMS 50th Anniversary meetings. This is truly a busy time for studying and discussing mathematics education in Canada.

Pat Rogers has undertaken the task of preparing this Newsletter, so much thanks to Pat for volunteering to do this. Eric Muller has put the conference materials together in his usual expert fashion. Bernard Hodgson and Norma Evans have assisted with the task of making sure our French/English versions are equivalent, so thanks to them.

I look forward to seeing many of you in London at the end of May.

...Sandy

Member Reports

The editors of the NEWSLETTER solicit reports on the activities of members of GCEDM/CMESG. This issue we have a research report from two of our colleagues at SFU. Won't you take a few moments and drop us a page or so about your research, curriculum development, or teaching activities?

On Preservice Teachers' Learning of Mathematics

Rina Zazkis and Stephen Campbell
Simon Fraser University, Burnaby, B.C.

We are currently in the last days of the second year of a SSHRC-funded, three-year project, entitled 'Learning Mathematics by Preservice Elementary School Teachers.' Among a variety of studies that discuss what teachers don't know but should know in order to teach mathematics effectively or, in a more recent trend, could know if taught 'right', we feel that our project is particularly important in the choice of mathematical subject matter: the main focus of our investigation is on preservice teachers' understandings of introductory Number Theory.

In the first year of the project we began to explore understandings of the concepts of divisibility and factorization. These concepts formed part of the curriculum for those participating in our research from our Professional Development Program for teacher certification here at SFU. However, we soon discovered that our participant's difficulties with these concepts were often related to more elementary numerical and arithmetic concepts, such as prime and composite numbers, distributivity and division. We have directed much of our subsequent research towards exploring these lacunas, or gaps, in preservice teachers understanding with the hope of charting some of the major features of this conceptual terrain.

We have obtained most of our data from clinical interviews conducted with volunteers enrolled in a core course in 'Foundations of Mathematics for Teachers'. The elementary number theoretical concepts addressed in this course include prime factorization, Fundamental Theorem of Arithmetic, GCD's and LCM's, divisibility and divisibility rules, among others. For clinical interviews we attempted to design questions that could be approached on several different levels of difficulty and/or sophistication. Thus, our participants usually have available some means of successfully addressing the problems we present to them. We hope, from their responses to the various permutations and

possibilities available to them, to chart our participants' understandings of the procedures and concepts involved.

As an example, consider the number

$$M = 3^3 \times 5^2 \times 7.$$

Is M divisible by 7? A significant number of our interviewees would calculate the value of M and divide it by 7 in order make up their minds. We eventually related this finding to students' incomplete understanding of the relationship between factors and divisors, as well as an 'experimental attitude' towards mathematics. We have observed a wide spectrum of differences in students' understandings of divisibility properties of M with respect to divisors, nondivisors, primes, prime powers and composites. If you work with preservice elementary school teachers, and have asked or wish to ask similar questions of your students, we would be very interested in hearing of your findings.

In our theoretical framework for analysis and interpretation of results we have drawn upon the ideas of Dubinsky and Sfard concerning concept 'evolution' (encapsulation/reification) from 'process' to 'object.' We have attempted to substantiate and extend these theories by providing more fine-grained descriptions of such 'evolution.' We are essentially concerned with unraveling, what Sfard has referred to as, 'tangled webs of understandings' by identifying conceptual and procedural inter-dependencies in this area and also by describing possible conceptual relations and connections amongst the 'objects' involved. This has not only required an investigation of relations between various number theoretical concepts as perceived by students, but also some phenomenological analyses (à la Freudenthal) of the domain as well.

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On pre-service teacher's learning of mathematics (continued from page 6)

Although we have begun with an investigation of teacher's content knowledge, our ultimate goal is to design more effective instructional strategies in areas pertaining to introductory Number Theory. Hopefully, such strategies will be applicable to other content areas as well. First and foremost, however, we wish to understand the development of students' knowledge in the domain of introductory Number Theory. Our results, so far, strongly suggest to us that such basic number theoretical concepts are not only intimately related with procedural and conceptual understandings of Arithmetic but, as such, form an important prerequisite in the development of Algebraic understanding as well.

For more detailed expositions of our activities in this regard, please refer to:

Campbell, S. and Zazkis, R. (1994) 'Distributive flaws: Latent conceptual gaps in preservice teachers' understanding of the property relating multiplication to addition.' In Kirshner, D. (Ed) *Proceedings of the Conference for Psychology of Mathematics Education - Northern American Group*, Baton Rouge, Louisiana.

Zazkis, R. and Campbell, S. (1994) 'Divisibility and division: Procedural attachments and conceptual understanding.' In *Proceedings of the 18-th International Conference for Psychology of Mathematics Education*, Lisbon, Portugal.

Zazkis, R. and Campbell, S. (1994) 'The Fundamental Theorem of Arithmetic: Used and confused.' In Kirshner, D. (Ed) *Proceedings of the Conference for Psychology of Mathematics Education - Northern American Group*, Baton Rouge, Louisiana.

Please write to us, care of the Faculty of Education at SFU, or contact us directly via e-mail:

Rina_Zazkis@sfu.ca
Stephen_Campbell@sfu.ca,

if you have any questions and/or comments, or if you would like a copy of our forthcoming paper:

Zazkis, R. and Campbell, S. 'Divisibility and multiplicative structure of natural numbers: Preservice teachers' understanding', *Journal for Research in Mathematics Education*.

Professional Meetings in 1995

Forum canadien sur l'enseignement des mathématiques—Canadian Forum for Education in Mathematics, mai/May 5-7, Québec.

GCEDM—CMESG, mai/May 26-30, University of Western Ontario, London.

Société canadienne pour l'étude de l'éducation [**SCEE**]—Canadian Society for the Study of Education [**CSSE**], juin/June 2-5, Université du Québec à Montréal, Montréal.

Réunion d'été 50e anniversaire de la Société mathématique du Canada [**SMC**]—50th Anniversary Summer Meeting of the Canadian Mathematical Society [**CMS**], juin/June 4-8, Toronto.

36e Olympiade internationale de mathématiques—36th International Mathematical Olympiad, juillet/July 13-25, North York.

Psychology of Mathematics Education [**PME**], July 22-27, Recife, Brazil.

Sixth World Conference on Computers in Education [**WCCE 95**], July 23-28; pre-conference workshop on Computer Based Environments for Learning and Teaching Geometry, July 21, Birmingham, UK.

Ninth Interamerican Conference in Mathematics Education [**IX IACME**], July 30 - August 4, Santiago, Chile.

2nd Annual Queen's/Gage National Mathematics Education Institute, August 9-13, Kingston.

Fifth International Symposium on Mathematics Education, October 16-18, Mexico City, Mexico.

Psychology of Mathematics Education - North America Section [**PME-NA**], Oct 21-24, Columbus, Ohio.

ICME-8

**8e Congrès international sur
l'enseignement des mathématiques
Séville, Espagne
14 au 21 juillet 1996**

ICME-8

**8th International Congress on
Mathematical Education
Seville, Spain
July 14 to 21, 1996**

Les Congrès internationaux sur l'enseignement des mathématiques sont organisés à tous les quatre ans en vue du développement de l'éducation mathématique et de l'amélioration de l'enseignement et de l'apprentissage des mathématiques. Les congrès précédents ont eu lieu à Lyon (France), Exeter (Royaume-Uni), Karlsruhe (Allemagne), Berkeley (États-Unis), Adelaïde (Australie), Budapest (Hongrie) et Québec (Canada). Si vous avez participé à ICME-7 en 1992, vous vous rappellerez sans doute avec plaisir la grande variété d'activités scientifiques, culturelles et sociales proposées aux délégués et aux personnes accompagnantes. Le prochain congrès ICME ne dérogera pas à cette règle! Se déroulant à Séville, dans le sud de l'Espagne (et zut pour la querelle du poisson!), le congrès ICME-8 offrira un programme scientifique très riche comprenant des conférences plénières et ordinaires, des groupes de travail et des groupes thématiques, des tables rondes, des ateliers, des présentations nationales, des communications brèves, des présentations de projets, la projection de films ainsi que des expositions diverses (notamment de livres, logiciels et matériels didactiques). On y attend de 3 500 à 4 000 participants et les langues officielles seront l'anglais et l'espagnol.

Bernard Hodgson, membre du Comité international du programme, pourra fournir de plus amples renseignements sur ICME-8 lors de notre rencontre de mai prochain. La 2e Annonce sera publiée au cours du second semestre de 1995 et donnera une information complète et détaillée sur le programme scientifique et social du congrès. Elle contiendra aussi les formulaires d'inscription, de logement et de communications brèves. Si vous désirez la recevoir, prière d'écrire à:

ICME-8
Apartado de Correos 4172
41080 Sevilla, España
Télécopie: 34-5-4218334
Courrier électronique : icme8@obelix.cica.es

The International Congresses on Mathematical Education (ICMEs) are organised every four years to increase the development of mathematical education in order to improve the learning and teaching of mathematics. Previous ICMEs were held in Lyon (France), Exeter (U.K.), Karlsruhe (Germany), Berkeley (U.S.A.), Adelaide (Australia), Budapest (Hungary) and Québec City (Canada). If you attended ICME-7 in 1992, you will recall with pleasure the wide variety of scientific activities and extensive cultural and social programmes that are provided for delegates and their companions. This ICME will be no different. Located in Seville, in the south of Spain (the fish wars notwithstanding), ICME-8 will provide a rich scientific program including plenary and ordinary lectures, working groups, topic groups, round table discussions, workshops, national presentations, short presentations, projects, films, special exhibits (including textbooks, software and various teaching materials). The Congress expects 3 500 to 4 000 participants. English and Spanish will be the official languages.

Bernard Hodgson, who is a member of the International Program Committee, is planning to provide more information at our meeting in May. The Second Announcement will be mailed during the second half of 1995 and will contain detailed information about the scientific and social program of the Congress together with registration and accommodation forms and guidelines for submission of short presentations. If you wish to receive this, please write:

ICME-8
Apartado de Correos 4172
41080 SEVILLA , ESPANA
Fax: 34-5-4218334
E-mail: icme8@obelix.cica.es

Rencontre de 1996

Il est déjà temps de penser à la rencontre annuelle de 1996. Le Comité exécutif souhaiterait recevoir vos suggestions quant au programme scientifique (noms de conférenciers et de responsables de groupes de travail, thèmes pour les groupes de travail et les groupes thématiques, etc.) de même que quant à l'organisation générale de la rencontre. Prière de faire parvenir vos commentaires dès que possible à Sandy Dawson ou à Eric Muller. Merci à l'avance de partager avec nous vos bonnes idées!

1996 Meeting

It is not too early to start thinking about the 1996 Annual Meeting. The Executive Committee would welcome your recommendations for the various sessions (names of possible plenary speakers, themes for Working Groups and Topic Groups, etc.) as well as your suggestions about the general structure of the Meeting. Please send these, as soon as possible, to Sandy Dawson or to Eric Muller. Thank you in advance for your good ideas!

L'Exécutif du GCEDM CMESG Executive 1994 - 1995

The members of the Executive extend an invitation to you to contact us about any item of interest. If you have something you want to suggest, if you have a concern you wish to raise, if you want more information etc., please let one of us know. In order to be of service to the membership, we need to be aware of what your interests are.

Les membres du Comité exécutif vous invitent à leur faire part de votre point de vue concernant n'importe quel aspect de la vie du GCEDM. Que ce soit pour transmettre suggestions ou commentaires, ou encore pour être mieux informé, n'hésitez pas à entrer en contact avec l'un d'entre nous. En nous faisant connaître vos intérêts, vous nous aidez à mieux vous servir.

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