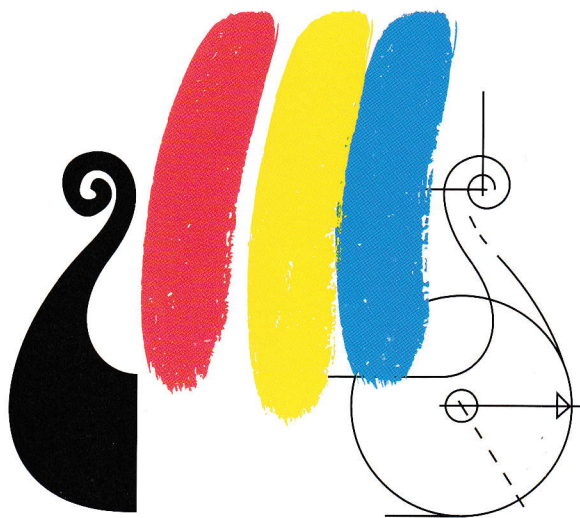


Kolgatin

10th International Congress on
Mathematical Education

PROGRAMME

FINAL PROGRAMME



I C M E
1 0
2 0 0 4

July 4-11 2004
Copenhagen, Denmark

www.ICME-10.dk

Organised in co-operation among the Nordic Countries



The ICMEs, of which the first was held in Lyon, France, in 1969, are held under the auspices of the International Commission on Mathematical Instruction, ICMI, founded in 1908.

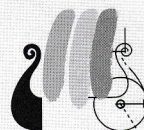
In formal terms, ICMI is a commission under the International Mathematical Union, which appoints the Executive Committee of ICMI. In addition, the Commission consists of the National Representatives, one from each of the around seventy member states of ICMI.

The quadrennial General Assembly of ICMI is held during each ICME.

At ICME-10 the recently established ICMI Awards, the Klein Award and the Freudenthal Award, will be presented for the very first time; this will take place at the opening ceremony. For 2004, the Klein Award will go to *Guy Brousseau*, France, and the Freudenthal Award will be awarded to *Celia Hoyles*, United Kingdom.

The history of ICMEs:

- ICME-1: Lyon (France), 1969
- ICME-2: Exeter (United Kingdom), 1972
- ICME-3: Karlsruhe (Germany), 1976
- ICME-4: Berkeley, CA (USA), 1980
- ICME-5: Adelaide, SA (Australia), 1984
- ICME-6: Budapest (Hungary), 1988
- ICME-7: Québec City, Québec (Canada), 1992
- ICME-8: Sevilla (Spain), 1996
- ICME-9: Tokyo (Japan), 2000;
- ICME-10: Copenhagen (Denmark), 2004
- ICME-11: Monterrey (probably) (Mexico), 2008



I C M E
1 0
2 0 0 4

Table of contents

Welcome to ICME-10	3
Organising Committees	4
General information	5
Programme structure and time table for ICME-10	8
DTU overview and Venue	9-10
Opening and closing sessions	11
P - Plenary sessions	12
R - Regular lectures	14
TSG - Topic Study Groups	22
DG - Discussion Groups	70
TA - Thematic Afternoon	99
NP - National Presentations	108
SGA - Workshops	118
SGA - Sharing Experiences Groups	134
Poster exhibition and Round Table sessions	140
ASG - ICMI Affiliated Study Groups	141
ICMI-studies	145
ICMI General Assembly	146
Newcomers	147
Special meetings and events	148
Mathematical Circus	151
Why Math?	154
Non-commercial exhibitors	156
Exhibitions	158
Exhibitions by location	160
Commercial exhibitors	162
Sponsor symposia and workshops	165
Sponsors	166
Social programme and excursions	168

Welcome

The International I
and the Nordic Co
to extend our war
Congress on Math
establish a Congre
gramme and with
social interaction,

We would also lik
to all those who m
International Prog
and of the Nordic
Congress Consult
the scientific prog
who have establish
worked behind th
not least: the spo

Above all, howev
who have decide
to the furthering,
and research in m

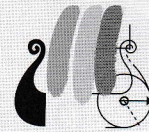
It is our hope tha
efforts. We wish



Mogens Niss
Chair,
International Program
Committee



The 10
is endo



I C M E
1 0
2 0 0 4

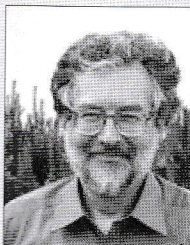
Welcome to ICME-10

The International Programme Committee, The Local Organising Committee, and the Nordic Contact Committee have the greatest pleasure and honour to extend our warmest welcome to all participants in the 10th International Congress on Mathematical Education, ICME-10. We have worked hard to establish a Congress with a rich, challenging and rewarding scientific programme and with an open and inviting platform for contact and friendship, social interaction, and exchange of cultural experiences.

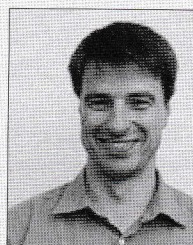
We would also like to take this opportunity to express our sincere gratitude to all those who made this Congress possible: The members of the International Programme Committee, of the Local Organising Committee, and of the Nordic Contact Committee; our Professional Congress Organiser, Congress Consultants; the hundreds of contributors to various aspects of the scientific programme, in particular all the Organising Teams, and those who have established National Presentations; all the volunteers who have worked behind the stage in various capacities; and last but certainly not least: the sponsors of the Congress.

Above all, however, we want to thank you, the individual participant, who have decided to spend a week in Copenhagen in order to contribute to the furthering, at an international level, of the practice, development and research in mathematics education.

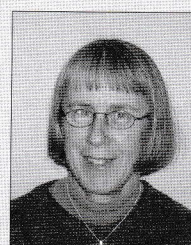
It is our hope that you will appreciate and enjoy the outcomes of all these efforts. We wish all participants a rewarding and enjoyable Congress.



Mogens Niss
Chair,
International Programme
Committee



Morten Blomhøj
Chair,
Local Organising Committee



Gerd Brandell
Chair,
Nordic Contact Committee



The 10th International Congress on Mathematical Education
is endorsed by Her Majesty Queen Margrethe the 2nd of Denmark

Organising Committees

ICMI Executive Committee (2003-2006)

President

Hyman Bass, USA

Vice-Presidents

Jill Adler, South Africa

Michèle Artigue, France

Secretary-General

Bernard R. Hodgson, Canada

Members at large

Carmen Batanero, Spain

Maria Falk de Losada, Colombia

Nikolai Dolbilin, Russia

Peter Lawrence Galbraith, Australia

Petar Stoyanov Kenderov, Bulgaria

Frederick K.S. Leung, Hong Kong, S.A.R., China

Ex officio members (IMU)

John M. Ball (President), United Kingdom

Phillip Griffiths (Secretary), USA

IPC

International Programme Committee

The International Programme Committee is responsible for the planning of the official scientific programme.

Jill Adler, South Africa

Abraham Arcavi, Israel

Michèle Artigue, France

Mariolina Bartolini Bussi, Italy

Bill Barton, New Zealand

Hyman Bass, USA

(Ex officio, President, ICMI)

Christer Bergsten, Sweden

Ole Björkqvist, Finland

Morten Blomhøj, Denmark

Marcelo de Carvalho Borba, Brazil

Nikolai P. Dolbilin, Russia

Elin Emborg, Denmark

(Administrative secretary)

Joan Ferrini-Mundy, USA

Hiroshi Fujita, Japan

Gunnar Gjone, Norway

Bernard R. Hodgson, Canada

(Ex officio, Secretary-General, ICMI)

Lim-Teo, Suat Khoh, Singapore

Mogens Niss, Denmark (Chair)

Kyungmee Park, R.O. Korea

Teresa Rojano, Mexico

Wilfried Schmid, USA

Zheng, Yuxin, P.R. China

LOC

Local Organising Committee

The Local Organising Committee is in charge of the practical planning of the Congress. The committee represents all levels and branches of the Danish educational system and the Nordic Contact Committee.

Leif Andersen

Michael Wahl Andersen

Morten Blomhøj (Chair)

Gerd Brandell, Sweden

Torben Christoffersen

Lisser Rye Ejersbo

Elin Emborg

(Administrative secretary)

Barbro Grevholm, Sweden

Ebbe Hansen

H. C. Hansen

Vagn Lundsgaard Hansen

Carsten V. Jørgensen

Leif Kragh

Kjeld Bagger Laursen

Bent Lindhardt

Claus Michelsen

Arne Mogensen

Mogens Niss

Anne Winther Pedersen

Tine Wedege

Carl Winsløw

NCC

Nordic Contact Committee

The hosting of ICME-10 in Copenhagen, Denmark, is based on an invitation from the Nordic countries, namely Denmark, Finland, Iceland, Norway and Sweden.

To ensure and develop the Nordic cooperation in relation to the Congress, a special Nordic Contact Committee was formed.

In terms of the traditional organisational structure of an ICME, the Nordic Contact Committee may be seen as playing the role of a National Committee.

Denmark

Morten Blomhøj

Carl Winsløw

Finland

Juha Oikkonen

Erkki Pehkonen

Iceland

Anna Kristjansdóttir

Norway

Otto B. Bekken

Ingvill Merete Stedøy

Sweden

Gerd Brandell (Chair)

Barbro Grevholm

Kerstin Pettersson (Secretary)

Roland Munther (Secretary)

Important addresses

Congress Venue

DTU

(Technical University of Denmark)

Anker Engelsevej 1

DK-2800 Kgs. Lyngby

Denmark

Congress Secretariat

Congress Consultants

Martensens Allé 8

DK-1828 Frederiksberg C

Denmark

Tel: +45 70 20 03 05

Fax: +45 70 20 03 15

icme@congress-consult.com

During the Congress the Secretariat

can be contacted in the registration

area, building 101.

Chair,

Local Organising Committee

Morten Blomhøj

IMFUFA, Roskilde University

P.O. Box 260

DK-4000 Roskilde

Denmark

Tel: +45 46 74 22 85

ICME10-LOC@ruc.dk

Chair,

International Programme Committee

Mogens Niss

IMFUFA, Roskilde University

P.O. Box 260

DK-4000 Roskilde

Denmark

Tel: +45 46 74 22 66

ICME10-IPC@ruc.dk

Chair,

Nordic Contact Committee

Gerd Brandell

Centre for Mathematical Sciences

Lund University

P.O. Box 118

SE-221 00 Lund

Sweden

Tel: +46 (0) 46 222 0538

Gerd.Brandell@math.lth.se

Important addresses

Congress Venue

DTU
(Technical University of Denmark)
Anker Engelundsvej 1
DK-2800 Kgs. Lyngby
Denmark

Congress Secretariat

Congress Consultants
Martensens Allé 8
DK-1828 Frederiksberg C
Denmark
Tel: +45 70 20 03 05
Fax: +45 70 20 03 15
icme@congress-consult.com

During the Congress the Secretariat can be contacted in the registration area, building 101.

Chair,

Local Organising Committee

Morten Blomhøj
IMFUFA, Roskilde University
P.O. Box 260
DK-4000 Roskilde
Denmark
Tel: +45 46 74 22 85
ICME10-LOC@ruc.dk

Chair,

International Programme Committee

Mogens Niss
IMFUFA, Roskilde University
P.O. Box 260
DK-4000 Roskilde
Denmark
Tel: +45 46 74 22 66
ICME10-IPC@ruc.dk

Chair,

Nordic Contact Committee

Gerd Brandell
Centre for Mathematical Sciences
Lund University
P.O. Box 118
SE-221 00 Lund
Sweden
Tel: +46 (0) 46 222 0538
Gerd.Brandell@math.lth.se

General information



I C M E
1 0
2 0 0 4

Posters

Posters are on display throughout the Congress and can be put up from Monday July 5 at 8.00 to Tuesday 6 at 14.30.

Posters are on display the following places:

Poster 1-101:	Building 208
Poster 102-160:	Building 116
Poster 161-220:	Building 101
Non-reviewed posters:	Building 306

The number given to each reviewed poster can be found in the poster abstract book. In each poster exhibition area there is a board showing the position of each poster according to poster number. Please observe the directions as to the position of the poster.

Non-reviewed posters are numbered on a list placed in the poster area of building 306.

Please consult the list for information on the position of your poster.

Assistants will guide you and supply you with pins and tape.

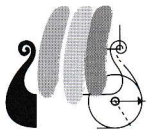
Please take down your poster at the end of the Congress.

Presentation, Speakers

All speakers whose sessions are to be transmitted are requested to consult the technicians in the Speaker's Preparation Area in building 210, 1 hour before your session at the latest.

Your presentation can be delivered on a CD-Rom, a 3½ disk, an USB memory stick or it can be downloadable from an online site. Your own laptop can be connected to the data projector if available in the lecture room.

All services in the Speakers' Preparation Area are also available for all other speakers.



ICME
10
2004

SGA

Workshops

12. Working out and use of the pedagogical diagnostic system

Alexander Kolgatin

The Computer Science Chair of the Physics and Mathematics Department,
The Kharkov State Pedagogical University named after G. Skovoroda, Ukraine

Co-authors: *L. Byelousova, A. Kolgatin* and *L. Kolgatina*

Time: July 5, 16.30-17.30 and July 6, 16.30-17.30

Place: Building 208, G63

The technology of pedagogical diagnostics and original free software are presented. Workshop participants work at the local computers of the computer network. At first they are testing on some mathematical topic by Information System of the Pedagogical Diagnostics "Expert 2.03" as pupils. The specialities of the adaptive algorithm of testing are discussed. The form of displaying the structure of knowledge and skills is discussed. Participants work as teachers. They organise appellation, analyse the tables of the results, difficulty of every question. By such way the participants analyse the structure of training of pupils group. The results, obtained at approbation of our tests in our university, will be presented for analysis. Then participants and chair discuss the principles of working out the test tasks for adaptive testing system and create the new test with "Expert 2.03".

13. Multidimensional approaches to classical topics of school mathematics by the creation of multimedial learning environments

Bertram Burgner and *Michael Meyer*

Fachbereich Mathematik, Volkshochschule Wesel, and Bischfliches Willigis-Gymnasium Mainz, Germany

Time: July 5, 16.30-17.30 and July 6, 16.30-17.30

Place: Building 210, D052

According to their leading concept of mathematical education the chairs will demonstrate the benefit of creating multimedial learning environments to offer multidimensional approaches to one and the same mathematical problem. By this way of learning the pupils become acquainted with various ways of solving, in which complementary mathematical concepts are involved. The examples are taken from the chairs own practice as teachers. Different approaches to the problems can be utilised by using dynamic-geometry-software, computer-algebra-systems or MS-Excel-sheets, finding approximate solutions by methods of trial, error and measurement or the general solution by Algebra or Calculus computations.

14. CAS-aided calculus teaching

Janusz Hektor

Mathematics, Walters State College

Time: July 5, 16.30-17.30 and July 6, 16.30-17.30

Place: Building 116, G045

Good problem solvers are in short supply in engineering and technology. This workshop focuses on enhancing problem solving skills in Calculus. Participants will enter, debug, and run programs from Calculus. The programs will demonstrate sequence, selection and repetition. The programs will be written in a language for ease of transport to other systems. The workshop has a close relationship with Texas Instruments. The workshop will use languages appropriate for integration with CAS.

15. Using the features and some applications of a symbolic calculator to study

the example of sequences and series

Flavia Floris

Mathematics Education, University of Coimbra

Time: July 7, 16.30-17.30 and July 8, 16.30-17.30

Place: Building 327, G10

This workshop is addressed to high school teachers with no knowledge of CAS. It has two goals: the first is to present the features of CAS and the second to work on examples showing how to exploit some of the features to improve their mathematical knowledge. The examples are drawn from the area of sequences and series. The workshop will alternate large time of work with short breaks.

16. Go forth and generalise

Jennifer Figgott

Mathematics Education, University of Cambridge

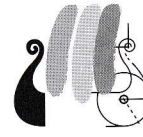
Co-author: *Liz Pumfrey*

Time: July 5, 16.30-17.30 and July 6, 16.30-17.30

Place: Building 210, D152

There is a common misunderstanding of the term 'generalise' that we believe this view should be challenged. This workshop offers mathematical experiences for students to develop their mathematical enrichment through a variety of learning activities.

The workshop will be based on developing their ability to generalise through problem solving activities and using technology.



I C M E
1 0
2 0 0 4

Public agencies and bodies



The European Commission, the Socrates Programme



UNDERSVINGSS
MINISTERIET Danish Ministry of Education

Danish Ministry of Science Technology and Innovation

Nordic Council of Ministers

Ministry of Education and Research in Norway

Ministry of Education and Science in Sweden

The Ministry of Education, Science and Culture in Iceland

Ministry of Education in Finland

Danish Research Council for the Humanities

Danish Natural Science Research Council

Lyngby Taarbæk Municipality
