ICMI

Bulletin

of the International Commission on Mathematical Instruction

No. 24

June 1988

Secretariat
Centre for Mathematics Education
University of Southampton
Southampton, SO9 5NH
England

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INTERNATIONAL COMMISSION ON MATHEMATICAL INSTRUCTION

EXECUTIVE COMMITTEE 1987 - 1990

EDITORIAL

This is a very special issue of the ICMI Bulletin - about five times the usual number of copies are being printed and we hope that everyone attending ICME6 will receive a copy. It is also special because it is devoted to the theme 'Mathematics in Society'. There are two main papers, one describing the arrangements for the 5th day at ICME6, the other a discussion document issued in connection with the ICME Study on 'The Popularisation of Mathematics'. A third paper describes developments in Southern Africa. We hope that these papers will prove of interest and will stimulate responses.

Many people will be seeing an ICMI Bulletin for the first time and so it may be useful to describe how it is usually circulated. The Bulletin appears every six months and is sent to all National Representatives. Some additional copies are circulated by UNESCO. It is not possible for us in Southampton to supply copies to individuals. However, we can supply additional copies to National Representatives on request and, since there is no copyright on any material published in the Bulletin, anyone is free to reproduce articles either in the orginal language or in translation.

K.E.H.
A.G.H.

ICMI STUDY NO. 4

THE POPULARIZATION OF MATHEMATICS

A.G. Howson, J.-P. Kahane and H. Pollak

Unlike other sciences, mathematics, or at least some parts of it, is taught to all schoolchildren; it is this which makes mathematics teaching and mathematics education so important. On the other hand there are few, if any, sciences which arouse such negative reactions or are as badly understood as mathematics. Most people, for example, would not even consider mathematics to be a living science. This study will be concerned with the public image of mathematics and mathematicians. It will seek to identify specific needs and to suggest ways in which mathematics can be more effectively popularized. Some of these needs and ways are not particular to mathematics; they also concern the popularization of any individual science, or of sciences in general. However, the popularization of mathematics has special features: obstacles, constraints and difficulties on the one hand, important possibilities and opportunities on the other. The present situation and record of past achievements differ from country to country and there is a need for international discussion in order to compare experiences, to clarify issues, and to promote further reflections and actions. This study, then, marks an important step forward, for it is intended that there should be a major gathering of those interested (in Leeds, England from 17-22 September, 1989) and that this should be accompanied by a nationally-organised, yet international, 'event' comprising a major exhibition, films, videos and lectures.

The Leeds meeting, therefore, has two aspects: a national event and an international study. Each aspect will benefit from the other and the planning of the two will be closely coordinated. The present discussion document is the first contribution to the international study. We hope that, like discussion documents issued in connection with previous ICMI studies, it will stimulate written contributions from all over the world. Such contributions, together with the present document, will form the basis for reports and discussion in Leeds. The resulting Proceedings of the meeting will then be published as ICMI Study 5.

1. A general framework: needs and methods for the popularization of science

Let us begin by making a few simple observations.

Advances in science and the day-to-day lives of humans are indirectly but, nevertheless, intimately connected. Strategical choices by states relating to economic, military and environmental matters, are fashioned by changes in technology and give rise to new technological challenges. Chains of relationships are then built up affecting all types of employment, the environment, public health, communications, home and family life, ... An informed citizen, whatever his or her occupation, should have some understanding of the crucial points on which these strategical choices are taken, some knowledge of the scientific advances appertaining to the technologies under consideration. Such a general scientific understanding is a democratic and economic need in every modern society and the provision of it may well be one of the decisive social challenges in the future.

However, there is now an increasing divergence between the advancement of science and the general understanding of the vast majority of human beings. Though science is universal and should help promote unity amongst people, we see that scientific research and scientific education may actually be organised in ways which increase inequalities and frustrations. Although scientific concepts are involved in every modern device used in everyday life, too many people are unable to grasp scientific ideas, do not know what a scientific way of thinking is, and, as a result, are too frequently pushed into irrational modes of thought. Even those who were well educated and equipped with some scientific knowledge all too often lack the time and incentive to enlarge their scientific understanding and to keep abreast of modern developments.

This, then, is the situation to which those involved with the popularization of science must respond. On the one hand there is an exponential increase of scientific knowledge produced by, and circulating amongst, small groups of specialists. On the other hand, there is a general, social need for a popular understanding of scientific discoveries, scientific achievements, scientific ideas, and scientific modes of thought. Any efforts to bridge that gap are part of popularization in its widest sense. In a more restricted sense, and that which this study will consider, the popularization of science involves all efforts made, or which might be made, to bridge the gap between scientific advances and public knowledge and information, apart from those which take place within school systems and in higher education.

The process of popularization involves three factors: the topics to be considered, the sections of the public it is wished to interest in the topics, and the media to be used in the processes of communication. To help in the making of consequent choices there will be a clear need to identify specific aims and criteria for decision-making.

No topic should be excluded a priori. Whenever there is a real advance in science it has to be known outside the small circle of specialists which participated in that advance - or it risks becoming lost. Any effort to make it known, to explain its meaning to a wider audience, is part of the process of popularization which can take place at a number of levels. At the highest level, the dissemination of advanced topics (through, say, expository papers) is an extreme, but an essential, stage in the general process. Yet there are many other topics of interest apart from contemporary research: for example, the history of a subject, its applications (particularly any of a novel character) and an understanding of the type of people involved in that science and of their motivation.

Similarly, no section of the public should be excluded. Children of all ages, workers, citizens, all types of professionals, even other scientists. All motivations have to be considered: professional interest, curiosity, general knowledge, ... , but also prejudices and fears.

All channels, too, must be exploited: books, newspapers, periodicals, films, exhibits, TV and radio programmes, software, ... Education and continuing education will play a decisive rôle complementary to that of popularization. Games and competitions will have a part to play - particularly in mathematics. Whatever the medium, popularization will be analogous to translation, and its quality will depend upon the skills and experience of the translator. Some of these are professionals: scientific writers and journalists. These may well have a catalytic rôle to play in involving scientists, teachers and other professionals in the general process of popularization.

2. Special features of the popularization of mathematics

The popularization of mathematics gives rise to certain special problems. First, many people's relationship to mathematics is governed by what happened to them in school. The affective consequences were often considerable: love, interest, dislike, hatred and, all too often, fear. It has to do with success in school mathematics and with the common belief that mathematics needs a special kind of mind and attracts only those of a particular disposition.

Mathematicians may reinforce this belief, either by refusing to participate in the subject's popularisation, or by the way in which they behave or explain things to laymen.

"Mark all Mathematical heads which be wholly and only bent on these sciences, how solitary they be themselves, how unfit to live with others, how unapt to serve the world".

This view of mathematicians, expressed by Roger Ascham, 16th century educator and tutor to Queen Elizabeth I of England, is one which is echoed in many later writings. Blaise Pascal, who was himself intimately concerned with mathematics, used to contrast 'esprit de géométrie' (a mathematical mind) with 'esprit de finesse' (an accurate mind). The latter was an attribute of 'honnêtes gens' (nobility and the high bourgeoisie), whereas the former was poorly regarded. This contrast has been a favourite theme for dissertations in French high schools, and has contributed to the view of mathematicians as strange characters, divorced from the real world.

Mathematicians may well reinforce this view when they speak or write about themselves and the mathematical world. As H.E. Robbins, himself a noted popularizer, puts it in his review of Ulam's Adventures of a Mathematician: if mathematicians appear as "thinking machines on the make, without discernible relation to parents, spouses or children, and oblivious to the human concerns of our times, ... if mathematical intelligence is strongly associated with emotional deprivation and social alienation, then ... we ... are in for trouble'.

Let us raise a few questions for discussion. What is the popular view of a mathematician? To what extent does that view influence both the wish to study mathematics, or, should the possibility arise, to support mathematicians in their work? To what extent do books or films about mathematics or mathematicians reinforce unfortunate beliefs?

Given the importance of the affective relation of individuals with mathematics, can we agree that one purpose of popularization must be to create a favourable mental association with mathematics whenever and wherever it might arise?

A second special feature of mathematics which hinders popularization is the kind of topics on which mathematicians work.

Even the most abstract parts of physics or biology have a direct connection with some practically important and familiar subject, such as energy, space, the environment, or health. Topology in 3- or 4- dimensional spaces, finite groups, or properties of ζ (s) in the critical strip cannot be connected as

easily with important, real life problems. (And attempts to link them with unimportant real-life situations may well prove counter-productive.) As L.A. Steen has pointed out ('Mathematics; our invisible culture') it may well be that the research frontier of mathematics is yet another order of magnitude more difficult to communicate than other frontiers of science, and that in many instances not even a professional scientist will attempt to comprehend a new mathematical direction.

This apparently contradicts our previous ruling that no topic should automatically be excluded from popularization. It raises the question: 'In the present state of mathematics and mathematical research, are there topics which can be explained only to an audience of mathematicians?'

Even at the level of an expository article for mathematicans there is another difficulty. Science is never a mere accumulation of results, but this is even more the case in mathematics than for any other science. When a theorem is produced, the most important result may be the lemmas. When a problem is solved, then it immediately loses its interest - the new focus of interest are the methods used in the solution. Theorems and problems have, in the main, but a limited time in the spotlight. It is the lemmas and methods which provide the matter for new theories, new concepts, new definitions.

How is it possible convincingly to present the real dynamics of mathematics as a living science?

The public image of mathematics and mathematicians and the esoteric character of advanced topics make its popularization extremely difficult. Yet other features of mathematics may ease our task.

(a) <u>The rôle of problems</u>

Problem-solving is a part of school mathematics, as well as a part of the activity of professional mathematicians. In no school activity can the activity of the professional researcher be more closely mirrored. 'How to solve it' is a natural and powerful introduction to results and methods. Popularization, then, is not concerned solely with transmitting information, but also includes the involvement of the public in mathematical activities.

(b) <u>Historical and cultural links</u>

No other science can boast such a history nor can exhibit so many cultural links. For example, ICMI Study 1 (<u>The influence of computers and informatics on mathematics and its teaching</u>) showed how these historical links can be reinforced by the use of

computers, for under their influence many parts of mathematics have come to life again after a long period of lying dormant. To trace the history of a topic may be an easy and useful approach to popularization at every level. Alternatively, to see how the same demands in different societies have led to similar, even if superficially different, mathematical ideas can show the extent to which mathematics is culturally based.

(c) New applications

In the past twenty years mathematics has been recognised as a useful, indeed essential, tool in many disciplines and technologies. ICMI Study 3 (Mathematics as a service subject) considers the implications of this within higher education. Yet the implications are equally great for continuing education and for popularization. The interest of the public in the applications of mathematics - in their contribution to societal well-being -can well stimulate an interest in the mathematics involved.

What other 'positive' features are there to be considered?

3. The methods of popularization

The methods used must depend on the kind of public on which particular efforts are being targetted. We want to set the switches so that people will look forward to mathematics, and to the use of mathematics, in a great variety of circumstances. If one is young, this means that one looks forward to mathematics in one's own education; if older, to the use of mathematics in everyday life, in one's job and in civic responsibilities, and to the part mathematics will play in the education of one's children or grandchildren.

Popular lectures, television, museums, travelling exhibitions, films, plays, ... may all be used in order to create this favourable mental association with mathematics. We hope that one outcome of this study will be the collection of a set of good examples coming from different parts of the world. We suggest that there should be a careful study of specific displays, films or books about mathematics or mathematicians from different points of view: their aims and objectives, their quality, the positive impact they have made ('favourable mental association'), their negative impact ('mark all Mathematical heads ...') and, in general, the reactions of the target audience.

Many people, through their careers and professions, are provided with important motivation for renewing contact with some

areas of mathematics. Popularization may provide a 'second chance' for those whose previous educational experiences of mathematics have not been successful. Many 'popular books' on mathematics can serve this end. Popularization may satisfy a specific need in relation to new technologies (robotics, computer graphics, computer assisted design, ...), statistical methods in social sciences, agriculture, biology, ... , operations research in management, ... ; part of it may be included in continuing education, in self-educational software, or in the general scientific and technical information contained in professional journals. How is this kind of popularization best organised? What are the potential traps to be avoided? How can one estimate the needs of the users and their reactions towards the books, etc. which they use?

Scientists are a particular case, as is the community of professional mathematicians and mathematics teachers at all levels of education. Are we satisfied with the expository papers and books on new trends in mathematics? If not, what can we suggest?

Involving others in mathematical activities is a very special way of popularization to some extent unconnected with trends in modern mathematics, for much use can still be made of classical concepts and puzzles. The wolf, goat and cabbage problem has entertained countless people for over a thousand years and will no doubt continue to do so. Mathematical columns in newspapers, mathematical puzzles such as Rubik's cube and many games, for example awele or kala in Africa, have excited the interest and curiosity of millions. How can we make best use of these opportunities for popularization? Can we analyse the relation between 'savoir faire' in puzzles and games, and mathematical modes of thought? If we use such methods of popularization, how do we prevent mathematics from being associated with the solution of inconsequential problems?

Recently mathematical competitions have developed and attracted public attention in many countries. What is the impact on society of such competitions as the very selective International Mathematical Olympiads and of competitions which are open to a much wider section of children, such as the Australian National Competition?

The links with history and culture are not always used as they might be. There are vast mines to explore. The history of mathematics is beginning to be treated as part of general human history and references now appear in books or collections. Greater emphasis is being placed on the study of mathematics in different societies and cultures. How can this new knowledge be exploited? Are there good examples of popularization which can be described and commented upon? In what ways can the

multicultural aspects of mathematics be used as a stimulus for its study? As we have written above, new technologies provided new stimulation and new tools. Computer graphics have enabled new and advanced mathematics to be introduced to vast numbers of people: think of the interest aroused because of the great beauty of the graphics associated with Julia and Mandelbrot sets. A new range of mathematical activities can also be introduced through the computer. How can the micro best be used in the popularization of mathematics? What software exists for this purpose? How effectively does it involve the user in mathematics, rather than, say, in art?

Not all of these questions will be appropriate for those in developing countries. Yet there is a rich amount of mathematical experience in each ethnic group, often described as ethnomathematics. To what extent is this experience related to the public image of mathematics and how can it be employed in popularizing the subject?

Methods are nothing without practitioners. This study provides an opportunity to gather personal experiences and views, to appreciate the specific rôle of a few gifted personalities (adept popularizers or popular figures from the mathematical world), and to stimulate the participation of all mathematicians and mathematics teachers in the process of popularization. In particular, the responsibility of professional mathematicians for popularization must be more carefully spelled out. What personal part should each play? How can mathematics teachers be best involved in the process?

How can writers and dramatists be encouraged to develop mathematical themes? How can reading and publishing be stimulated? How can we build on the very best examples of popularization which can be seen, read, heard and participated in today?

Call for papers

We hope that readers of this discussion document will respond to it by writing papers on specific themes or questions. These will be welcomed both from those who cannot participate in the closed international seminar and from those who would like an invitation (the number of which will be limited) to do so. Papers should be submitted no later than 30 April, 1989. Copies should be sent to

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Remember that, by themselves, descriptions of attempts at popularization will have little value. There is a need to put the attempt within a particular context: to describe the target audience, the choices made (relating both to material and medium), and to provide some type of evaluation - however subjective - what works, what are the traps to avoid.

Those wishing to submit films, videos, ... for possible exhibition or to nominate books which might be included in a display should write to G.T. Wain, School of Education, The University, Leeds LS2 9JT. Please send a full description including technical details (length, subject matter, intended audience, ...).

There will be financial assistance available to bring some participants from developing countries to Leeds. Other participants, however, will, in general, be expected to pay their own travel and subsistence costs. There will be no conference fee for the international seminar.

Previous ICMI Studies

The influence of computers and informatics on mathematics and its teaching, Cambridge University Press, 1986.

School Mathematics in the 1990s, Cambridge University Press, 1987.

Mathematics as a service subject, Cambridge University Press, 1988.

Mathematics education and cognition (in preparation).

See also:

Selected papers on the teaching of mathematics as as service subject, Springer-Verlag, 1988.

ICME 6

Fifth Day Special:

Mathematics, Education, and Society (MES)

The special program of the 5th day is novel in ICME congresses. Usually the main task of the scientific community concerned with mathematics education is to support the teaching and learning going on in the schools. However, increasingly the interrelation between mathematics education and educational policies has become a matter of worldwide consciousness and it is evident now that mathematics education has a serious political dimension. The special program of the day therefore addresses the main social and political issues surrounding mathematics education. The program is organized in four timeslots:

1) Mathematics Education and Culture;
2) Society and Institutionalized Mathematics Education;
3) Educational Institutions and the Individual Learner;
4) Mathematics Education in the Global Village.

In timeslot 1 general presentations on the central themes of the day will open the special program; in timeslot 2) and 3) we will have panel presentations and discussions on **specific topics;** and in timeslot 4) there will be five hearings on the **main questions** society can ask of the international mathematics education community.

Within each timeslot several parallel sessions will take place and participants can choose which session they will join in each timeslot. A brief outline of each session and the planned presentations will be given followed by the program schedule.

Timeslot 1) Mathematics Education and Culture

Theme 1: Social History of Mathematics Education

This theme concerns some significant aspects of the history of mathematics education, which has contributed to the determination of today's situation. The

first speaker, the Hungarian mathematics historian **Arpad Szabo**, will show in his presentation "Mathematics and Dialectics" that fundamental principles like mathematical definitions, reasoning and proving were raised by the philosophy of the Eleatics; and that the system of mathematics as it is formulated in Euclid's Elements, is partly stimulated by the dialectics of Eleaticism, and is partly a further developed construction based on these dialectics. **Ahmed Djebbar** from Algeria will compare the contents of mathematics education of North Africa in the middle ages with its role in actual teaching. **John Fauvel** from the Open University, UK, will set up the question :"Should we bring back the mathematical practitionner?" referring to some important aspects of the social history of mathematics education in the Renaissance. In a case study of Britain he will report how British mathematics educators coped with didactic problems, how they had to struggle for acceptance of mathematics as a practical and academic subject, and in which debates about teaching practices they were involved. **Gert Schubring**, FRG, will discuss theoretical categories for investigations in the social history of mathematics education and some characteristic patterns. He will aim to offer a more comprehensive framework for historical studies as well as for an understanding of the role of mathematics in both liberal education and vocational training.

Theme 2: Cultural diversity and conflicts in mathematics education

Cultural diversity is commonplace in education around the world, and mathematics educators have a particular interest in certain issues which will be addressed in this theme. **Terezinha Nunes Carraher**, from Brazil will speak about material embodiments of mathematical models found in use in everyday life in Brazil. **Lloyd Dawe**, Australia, will discuss typical problems of mathematics teaching and learning in village schools of the South Pacific. **Murad Jurdak**, Lebanon, will focus on the roles of religion and language of instruction in mathematics in as far as the two factors operate as cultural carriers or cultural barriers in mathematics education. By contrasting two main and provoking theses, illustrated by the counter-examples of Saudi Arabia (rich) and Lebanon (poor) he will explain clearly the dilemma of balancing the needs of socio-economic development and the preservation of the ecology of the culture. The final speaker on theme 2, **Claudia Zaslavsky**, USA, will emphasize the necessity for the expansion of the curriculum at any level to include culturally specific mathematical practices as social practices in daily life ("ethnomathematics") and present possibilities for doing so in the elementary and middle grades

Theme 3: The cultural role of Mathematics Education in the future

Worldwide cultural domination and unequal distribution of opportunities to take part in education characterize the present situation. In theme 3, therefore, future perspectives of mathematics education under these conditions will be explored. **Leone Burton,** UK, going beyond already discussed features on gender and mathematics education, will focus on another area which still requires investigation: this is the degree to which the discipline of mathematics together with its predominant pedagogy reflects an inaccurate, socially stereotyped and misguided view of the nature of mathematical activities. This she will clarify by putting the question: "Mathematics as a cultural experience - whose culture?". **Philip J. Davis,** USA, will take the position that mathematics education has to redefine its goals so as to create a citizenry with sufficient knowledge to provide social backpressure on the relevance and development of future mathematizations and to view applied mathematics as a "social contract". **Sergio Salbany** from Zimbabwe will compare the goals of society and the aims of mathematics education stressing the freedom that comes from creativity in mathematics. The Belgian anthropologist **Rijk Pinxten** will focus on the relevance of differences in "cultural knowledge" for mathematics education. As cultural knowledge he describes kinds of ethno-ontology, cultural premises, and institutions to view the world which are partly implicit and only partly explicit, but pervade and direct the explicit knowledge system and thinking within a culture.

Timeslot 2) Society and Institutionalized Mathematics Education

Mathematics education and culture, the theme of the timeslot 1), should now be examined at two different levels: in timeslot 2) at the level of institutionalized education embedded into the society, and in timeslot 3) culture is seen as a factor in the relationship of the indivudual process of learning mathematics and the social interactions framed by the instituions of the educational systems.

Topic 2.1: Mathematics as a cultural product

Mathematics is not culturally neutral. The relationships will be discussed between the cultural origins of mathematics and its future perspectives. By reflecting implications of the recently developed new and (mathematized) technologies and by combining arguments from the history and sociology of sciences with epistemological reflections, the Danish mathematics historian **Jens**

Hoyrup, in "On Mathematics and War", will ask the mathematicians (especially in their role as teachers) to take over the responsibility for the social use of their work. Jens Hoyrup will ask: "In which sense is it possible to understand scientific cognition as a neutral instrument, and in which not? What can mathematicians do in order to avoid the situation of their science and the scientific institutions in general staying or becoming virtual criminals against humanity?" These are questions which do concern all mathematics educators. **George Ghevarughese Joseph,** UK, deplores the fact that there is a widespread Eurocentric bias in the production, dissemination and evaluation of scientific knowledge for centuries centuries, and seeks to destroy the existing Eurocentric paradimatic norms, not only in history, anthropology, and ethnology, but als in histroy mathematics and mathematics education. **Heiner Meyer,** GDR, intends to show how mathematics education in general can be enriched and improved by courses on "History of mathematics" and "Philosophical problems of mathematics". **Leo Rogers,** UK, will plead for examining the history of mathematics in its social context to identify possible conflicts in the meaning and intention between "intended" and "actual" uses of mathematics, and to create a social epistemology of mathematics.

Topic 2.2: The image of mathematics in society

Mathematics is widely considered to be independent of social, institutional, and moral implications and consequences. This image will be analyzed from different viewpoints. **Rudolf Bkouche,** France, will discuss the recent reforms and their revisions in France and their social image; **Gilah Leder,** Australia, reports a case study, in which she tried to identify, quantify, and operationalize the society's image of mathematics by examining the perceptions held about mathematics by a group of tertiary educators without special expertise in mathematics. **Stephen Lerman,** UK, will show that despite the apparent proliferation of philosophies of mathematics (as discussed by mathematicians, too) schools of thought fall into two streams, the absolutist and the fallibilist; i.e. search for certainty of mathematical knowledge versus viewing mathematics as a social invention. Some implications for mathematics education will be discussed. The last speaker on this topic, **Chandler Davis,** Canada, will renew the discussion of the responsibility of scientists (mathematicians) for the uses to which society puts the results of their research ,and will ask for "A Hippocratic Oath for mathematicians!".

Topic 2.3: Sociology of institutionalized mathematics

Mathematics and the way that mathematics is conceptualized, thought, and learned, is dependent both on institutions and on political decisions which will be discussed under this topic. **Eduard Glas,** Netherlands, will present an historical example by discussing some cultural differences within the Paris Ecole Polytechnique 1754 - 1809. **Renate Tobies,** GDR, will describe the influence and the activities of Felix Klein in the Teaching Commission of the 2nd Chamber of Prussian Parliament. **Emma Castelnuovo,** Italy, will speak about the teaching of geometry in Italian high schools during the last two centuries as a steady attempt to introduce geometry to a larger sector of society and to connect it more with reality. **Michael Price,** UK, will offer some reflections on the role of associations in mathematics education and their relationship to and influence on other political and social pressure groups within the context of national educational systems.

Topic 2.4: The mathematics curriculum as a social issue

In the history of mathematics education epistemological and socioeconomical conditions of mathematics learning are strongly related. The issues surrounding this relationship will be considered under these topics from different points of view. **Michael Otte,** FRG, in his presentation "Mathematics for all and the epistemological problems of mathematics education", will argue that "the dichotomizations current in didactics are both false as far as practical, aesthetical, theoretical, philosophical, and many other kinds of experiences are equally essential for the development of the personality, - and productive, as far as the rationality of human learning and human knowledge is no 'flat world' but includes belief systems, convictions, dogmas, ties to contexts". **Neil Bibby and John Abraham,** UK, through considering a few cases of controversy in the historical development of mathematics, will analyze the implications of studying controversies for mathematics education. **Bernard Charlot,** France, will discuss social controversies in mathematics education by means of the introduction of the "modern mathematics program" in France. **Manmohan S. Arora** will pose two questions to the panel which he thinks are universal today and have urgently to be analyzed and answered: "Why is there a growing dissatisfaction all around with the mathematical competency of high school graduates that we produce? Why are the literates from school so mathematically illiterate?"

Topic 2.5: Non-school alternatives for mathematics education

Expanding social needs for mathematical qualification and within school obstacles preventing the development of a broader mathematical culture, call for new solutions to the problem. The panel members will offer and discuss possible alternatives. **John D. Volmink,** South Africa, will discuss some examples of non-school mathematics education. Such examples are the more important under conditions of political systems that exclude systematically, for racial, political, religious or sexual reasons, certain groups of the population from adequate qualifications. **Sixto Romero Sanchez,** Spain, will report on the experiences with a very successful and socially acknowledged radioprogram to popularize mathematics developed and conducted by a group of mathematics educators at the Polytechnical University of Huelva. **Virginia Thompson,** USA, will discusss the role of the already famous American "Family Math" - Project; and **Jeff Evans,** UK, will analyze, what sort of statistical skills are needed by adults in non-specialist work contexts and how these skills might be developed in more informal settings outside the educational system.

Topic 2.6: The mathematics demands of the economy

An important social constraint on mathematics education is given by the various demands of the economy with its challenges and its risks. **Guida Maria Correia P. de Abreu** and **David William Carraher,** Brazil, will show that, although the general mathematical abilities of the Brazilian sugar cane workers vary greatly because of their poor schooling they use quite well knowledge and techniques to measure and calculate which are cultural in nature, having their roots in the social traditions of the sugar cane communities. **Wang Chang Pei,** Peoples Republic of China, will give examples of differences in mathematics education between rural and urban areas in China despite the national uniform curriculum. **Howard Russel,** Canada, will present the "Generic skills / Economic Development Project" as an attempt to match the demands of the economy. On the other hand, Bernh**elm Booß-Bavnbek,** Denmark, will show how a rapidly growing number of mathematical models and simulations turn out to be sufficient for the design of workable technological improvement, but many of them are not sufficiently transparent to provide the necessary means for their technological and social control. This places new and urgent demands on public eduction in mathematics for a democratic society.

Topic 2.7: Mathematics education under different cultural constraints

The conditions of mathematics education in industrialized and in developing countries are very different. The implications of serious cultural differences will be discussed by the panel members: **S.K. Bamba,** Ivory Coast, will speak about some critical issues concerning mathematics education in the Ivory Coast; **Jens Naumann,** FRG, will report a partnership-project with Senegalese villages involving Berlin teachers organized in the German United Nations Associations, and practical aspects of basic mathematics teaching there; **Diane Rosenberg,** Argentina, will present her experiences in transforming the Dutch Hewet-Project into quite a different culture "Hewet-Argentina". **Munir Fasheh,** West Bank, will contrast the informal mathematical practice socially used in daily life and work with the institutionalized formal mathematics in order to analyze and criticize the role of "hegemonic education" implanted in developing countries.

Topic 2.8: Society as a source of ideas for mathematics teaching

Mathematics teaching if it is to be relevant for the learner has to take into account the broad range of sources offered by the specific culture of a society. **Brian Hudson,** UK, will outline the results of a project aiming to develop materials and approaches for the mathematics classroom from a global perspective and hence dealing with issues related to world development and military technology/arm race. **Tadasu Kawaguchi,** Japan, will show mathematical thoughts being latent in various artistic activities like literary and painting work, theatre plays and movies. **Diana Schultz,** Australia, will describe the theoretical framework and practical strategies for developing and implementing a mathematics education program designed to make mathematics more meaningful to a larger majority of the school population (Primite: real life integrated mathematics in teacher education). **Joop van Dormolen,** the Netherlands, will talk about the values of texts for learning mathematics for real life by showing examples of written materials and by reporting on how the values influenced the way the texts became what they are.

Topic 2.9: How autonomous is the mathematics teacher?

In any society the teacher is socially constrained and some of the consequences for mathematics educators are considered in this topic. **Diane Siemon,** Australia,will describe generally the social constraints surrounding teachers work and plead for investigation of the belief-systems underlying the teaching and

learning of mathematics. **Paul Ernest,** UK, asserts that all reforms depend on the teacher's system of beliefs, e.g. conceptions of the nature of mathematics and models of teaching and learning mathematics, and will present a model of mathematics teacher's knowledge, beliefs and attitudes which elucidates the theoretical relationships between the teacher's belief system, practice of teaching mathematics, and the learner's belief. **Kurt Kreith,** USA, will report about a teaching credential program for the recruitment and training of master teachers which has developed training and certification procedures that correspond, in appropriate ways, to those employed in other professions, such as medicine and law. **John Suffolk,** Zambia, will speak about the specific difficulties constraining mathematics teachers in developing countries.

Topic 2.10: Ethnomathematics and schools

Mathematical knowledge of a different kind from that which is usually dealt with the school curriculum is considered in this topic. Sources for ethnomathematical ideas are varied, and their significances in schools will be discussed by the panel members. **Gloria F. Gilmer,** USA, will give a survey report of research activities in ethnomathematics as reported to the newsletter of the International Study Group of Ethnomathematics. **Randall Souviney,** USA, will discuss the role of Indigenous Mathematics Project in Paua New Guinea. **George Eshiwani,** Kenya, will talk about the customs of primary schooling in Kenya with specific reference to mathematics, and will relate school mathematics to carpentry and tayloring. **Eduardo S. Ferreira,** Brazil, will show by a lot of examples from history of mathematics and ethnomathematics that both the generic principle and ethno-mathematical methods are linked and can be part of the same method of the teaching mathematics in school.

Timeslot 3

Educational Institutions and the Individual Learner

Topic 3.1: Individual and social learning motivations

Mathematics is learned in a social setting and the significance of social motivations needs to be better understood by mathematics educators. **Anne-Nelly Perret-Clermont** and **Mari L. Schubauer-Leoni,** Switzerland, will consider the learning of mathematics as orginating from an intersubjective construction

between the teacher and students and illustrate how the "didactic contract" controls all learning and teaching. They will also address the social constructions of meanings of mathematical activities and concepts functions that the contract permits. **Timothy E. Erickson,** USA, will discuss certain attributes of cooperative exercises and cooperative materials, developed by the EQUALS project, and how they work together to help produce successful experiences for both students and teachers. **Egon Mermelstein,** USA, will distinct between aggressive and non-aggressive humor in the mathematics classroom and by examples of humor shown to be in conflict with human dignity and impede learning or to enhance dignity and facilitate learning in mathematics. **Albrecht Abele,** FRG, will report on an analysis of video-taped situations to show the interdependence of social learning and mathematics learning.

Topic 3.2.: Cultural influences on learning

Children come to school as culture-bearers and the importance of this for mathematics learning will be discussed in this topic. **Analucia Dias Schliemann** and **Nadja Marie Acioly,** Brazil, will provide data on how everyday experience with numbers affects the way people solve problems and analyze how the numbers and the arithmetical operations involved in the problem affects the efficiency and the strategy used to find the solutions. **Frederick Leung,** Hong Kong, will discuss four characteristics of the Chinese culture that might influence mathematics learning: the Chinese stress on filial piety and respect for superiors, the Chinese stress on memorization and practice, the characteristic of the Chinese language and the high parental expectation of the Chinese.**Kathryn Crawford,** Australia, will argue that - as school mathematics is not socially neutral - students from minority groups need experiences which provide concept development in qualitative aspects of the contexts in which mathematics is used in the dominant technical culture, that is, they need to know what to reason about, instead of overemphasis on instrumentalism offered by most teachers to know how.

Topic 3.3: Are girls underprivileged around the world?

The issue of girls' underachievement in mathematics has been discussed for some years. In this topic special considerations will be given to the social context surrounding the relation of girls to mathematics. **Erika Kuendiger,** Canada, will present data on the attitude scale "Gender Stereotyping" of the SIMS-study and discuss that in light of differences in the general learning environment. **Jeanne**

Peiffer, France, will examine how textbooks transmit mathematical knowledge and why that give an "apprenticeship"what is more authoritative and more normative because of the role of mathematical formalism. This she argues , may paralyse women and destroy their creativity and cause their failures in mathematics learning. **Frank J. Swetz**, USA, will review findings from non-western societies which indicate that mathematical abilities and attitudes are culturally related and - as in the reported case of two Malaysian studies - that sex-related differences may contrast sharply with opinions popularly held in the West. **Gila Hanna**, Canada, will report on the results of the mathematics achievement of girls and boys in twenty countries, using the data collected by SIMS, which show that in the majority of the countries girls are not underprivileged in relation to their achievement in mathematics in grade 8., This changes in grade 12,however, and she will compare attitudes in the countries in which significant sex differences were observed to attitudes in countries in which such differences were non-existant to generate interesting hypotheses about the factors responsible for girls' inferior or superior achievement in mathematics.

Topic 3.4: Societal determinants of learning

This topic concerns the influence which the childrens's society experts on their mathematics learning. **Joan Bliss**, and **H.N. Sakonidis**, UK, have investigated a cross-cultural study - in England, Greece, and Spain - of children's ideas about what is really true in four curriculum subjects - mathematics, science, history, and religion and will report on their findings. **Gustav Adolf Lörcher**, FRG, will describe the specific problems in mathematics education which result in the fact that - both in developing as in industrialized countries - many children learn mathematics in a foreign language and try to offer some ways to deal with them. **Ali Rejali**, Iran, will present a study of the causes for which students are not interested in studying mathematics in Iran and some suggestions to solve the problem. **Bernd Zimmermann**, FRG, will demonstrate that "mathematics for all" and "mathematics for the gifted" are not only not exclusive alternatives, but the main issue "mathematics for - or better with - all" can be proliferated by experiences and research in the special area of mathematically gifted students.

Topic 3.5: The social arena of the mathematics classroom

The special context for learning which is the "mathematics classroom" has particularly important social features which will be explored in this topic. **Josette**

Adda, France, will show, how the taboos, the forbidden acts and compulsory rituals in the mathematics classroom create an artificial world as far from the mathematical "world of ideas" as from the external "world of everyday life" and discuss why this sociological context is in favour of pupils from high sociocultural level. **Tom Cooper**, Australia, will analyze primary mathematics teaching in terms of its role in the social and political function of schooling in reproducing the present society. He will demonstrate that mathematics teaching is to be seen to have a formidable role in reproducing crucial ideologies, a role made more powerful because of the notion of objectivity that surrounds mathematics itself and mask hegemonic functions. **Andrea L.Petitto**, USA, intends to describe the structure of classroom discourse and to discuss the significance of this kind of discourse for the difficult and often gradual process of disambiguating arithmetic procedures and linking them to children's own intuitive understanding of number. **Terry Wood**, USA, will analyze the evolving regularities or patterns identified in whole class interactions as the teacher and children discussed solutions to arithmetic activities; focussing on the implicit, taken-for-granted obligations that the teacher and students feel under in particular situations, and on their expectations for each other.

Topic 3.6. Learning under difficult conditions

For some children, learning mathematics is specially difficult. Typically their problems are considered as psychological, but in this topic there will be a focus on the social nature of their problems. **Arthur Powell and Marilyn Frankenstein**, USA, will explore the needs of "non-traditional" learners, "outsiders" of the educational system like women, ethnic and national minorities and other working class adults who are severely underprepared to successfully meet the challenges of the traditional curricula of higher eduction. They will present alternative approaches of "non-elitist "mathematics education which meet their intellectual needs in mathematics. **Françoise Cerquetti-Aberkane**, France, will describe the mathematics education program in special classes for children with difficulties and criticize certain parts of that "special pedagogy". **N.C. Taylor**, South Africa, will report on some findings from case studies conducted among 13 years old students in Soweto into the methods employed in the solution of problems on equivalent fractions. His findings place a question mark over the utility of those psychological perspectives on learning which seek to separate the cognitive and affective domains, and those multicultural and

ethnomathematical considerations which see cultural aspects as providing a handle for lifting "underprivileged" learners into the mainstream.

Topic 3.7: Mathematics education in multi-cultural contexts

Within the mathematics classroom there can be serious cultural conflicts which will challenge both learners and teachers to negotiate satisfactory practice. **Raymond A. Zepp,** Macau, will assert that a new way of thinking about the relationship between language and mathematics is necessary, and will describe the new directions that recent research has begun to move towards. **Ina Kurth,** FRG, will reflect on some special problems of children learning mathematics in a foreign language and illustrate her presentation with examples from the material particularly developed for such children. **Helen Watson,** Australia, will discuss her work with teachers who in their everyday practice are confronting the problems of teaching and learning mathematics in two worlds: Yoruba teachers in Nigeria in West-Africa, and Aboriginal-Australian teachers in the Tanami and Laynhapuy region of Northern Australia; together they have developed understanding of the relation between conceptual systems, and considered the perplexing problems of mathematical education in a bicultural situation. **Norma C. Presmeg,** South Africa, will explore ways in which cultural continuity may be fostered in the context of mathematics education. She is well experienced in working with multi-cultural classroom situations and with adult students which might be in a similar situation to learners in developing countries around the world.

Topic 3.8: Ethnomathematical practices

How can the mathematics learning situation be structured as to provide for the acceptance of the child's ethnomathematical knowledge? The panel members will offer various examples of ethnomathematics: **Salimata Doumbia** , Ivory Coast, will speak about the mathematics in some traditional African games; **Sergio Roberto Nobre,** Brazil, will describe the mathematics involved in the most popular, but forbidden by law, lottery in Brazil. **Jean Lave,** USA, will analyze and compare the conception of teaching, curriculum and "natural" distribution of success and failure as well as the specific cultural-historical role of mathematics in the creation of social identities in two contexts, Liberia and USA.

Topic 3.9: Social construction of mathematical meaning

Mathematics knowledge is both individually and socially constructed, and educators should give a greater priority to the latter than they have typically done. **Paul Cobb,** USA, will outline an analysis of two selected childrens' construction of arithmetical knowledge during a school year, focusing particularly on the major cognitive restructurings. **Erna Jackel,** USA, will analyze the social contexts that children mutually construct as they interact to complete mathematics tasks in small groups. **Barbara Fresko,** Israel, will present analyzed data and discuss results of a study which explored the nature of the learning environment in the junior high school mathematics classroom and which determined to what extent class factors (grade level, ability level) and teacher traits (professional training, classroom experience) are able to explain the environmental difference among classes.

Timeslot 4: Mathematics Education in the Global Village

In the five hearings of this timeslot questions will be put, on behalf of society, by the Chair/Questioner to a panel. The Questioners will focus on the accountability of the international mathematics education community in relation to the particular hearing theme. The hearings are to be a summary and conclusion of the special programme of the day in concentrating the panels on very specific questions. Selected speakers of the special program will be questioned in these hearings that contributed to special themes and topics in order to get their discoursive or conflicting answers. **Christine Keitel,** FRG, and **Yves Chevallard,** France, will put questions on the theme: Which and whose interests are served by mathematics education? **Jens Naumann,** FRG, will direct the hearing theme: How does mathematics education relate to destructive technological developments? **Jeremy Kilpatrick,** USA, will ask around the theme: Do mathematics educators know what they are doing? **David Wheeler,** Canada, will be Questioner of the hearing: What are the challenges for ICMI in the next decade?; and **Ubiratan D'Ambrosio,** Brazil, will question in the hearing: What can we expect from ethnomathematics?.

MES Programme Schedule

Organizers: Alan Bishop, UK
Peter Damerow, FRG
Paulus Gerdes, Mozambique

Timeslot 1 (8.30 - 10.00):

Mathematics Education and Culture

1.1. Theme 1:
Social history of Mathematics Education
Chair: Peter Damerow, FRG

Arpád Szabó, Hungary
Mathematics and Dialectics

Ahmed Djebbar, Algeria
Le contenu de l'enseignement mathématique dans le Nord de l'Afrique au Moyen-âge et son rôle dans l'enseignement actuel

John Fauvel, UK
Should We Bring Back the Mathematical Practitioner? Learning from the Social History of Mathematics Education in the British Renaissance

Gert Schubring, FRG
Theoretical Categories for Investigations in the Social History of Mathematics Education and Some Characteristic Patterns

1.2. Theme 2:
Cultural diversity and conflicts in Mathematics Education
Chair: Paulus Gerdes, Mozambique

Terezinha Nunes Carraher, Brazil
Material Embodiments of Mathematical Models in Everyday Life

Lloyd Dawe, Australia
Mathematics Teaching and Learning in Village Schools of the South Pacific

Murad Jurdak, Lebanon
Language and Religion as Cultural Carriers and Barriers in Mathematics Education

Claudia Zaslavsky, USA
Integrating Mathematics with the Study of Cultural Traditions

1.3. Theme 3:
The cultural role of Mathematics Education in the future
Chair: Alan Bishop, UK

Leone Burton, UK
Mathematics as a Cultural Experience - Whose Experience?

Philip J. Davis, USA
Applied Mathematics as Social Contract

Sergio Salbany, Zimbabwe
The Goals of Society and the Aims of Mathematics Education

Rik Pinxten, Belgium
World View and Mathematics Teaching

Timeslot 2 (10.30 - 12.00):

Society and Institutionalized Mathematics Education

2.1. Topic:
Mathematics as a cultural product

Jens Høyrup, Denmark
On Mathematics and War

George Ghevarughese Joseph, UK
Foundations of Eurocentrism in Mathematics

Heiner Meyer, GDR
A Contribution towards an Improvement of the Mathematical General Education by the Courses "History of Mathematics" and "Philosophical Problems of Mathematics"

Leo Rogers, UK
The Cultural History of Mathematics as a Basis for Philosophies of Mathematics Education

2.2. Topic:
The Image of mathematics in society

Rudolf Bkouche, France
Pour une critique de la raison mathématique

Gilah Leder, Australia
The Image of Mathematics in Society: A Case Study

Stephen Lerman, UK
A Social View of Mathematics - Implications for Mathematics Education

Chandler Davis, Canada
A Hippocratic Oath for Mathematicians?

2.3. Topic:
Sociology of institutionalized mathematics

Eduard Glas, The Netherlands
Mathematics between Form and Function: Cultural Differences within the Paris Ecole Polytechnique, 1794-1809

Renate Tobies, GDR
The Activities of Felix Klein in the Teaching Commission of the 2nd Chamber of Prussian Parliament

Emma Castelnuovo, Italy
The Teaching of Geometry in Italian High Schools During the Last Two Centuries: Some Aspects Related to Society

Michael H. Price, UK
Some Reflections on the Role of Associations in Mathematics Education

2.4. Topic:
The mathematics curriculum as a social issue

Michael Otte, FRG
"Mathematics for All" and the Epistemological Problems of Mathematics Education

Neil Bibby / John Abraham, UK
Social History of Mathematical Controversies: Some Implications for the Curriculum

Bernard Charlot, France
The Reform of Mathematics Education in the Institutional, Economical, and Social Context of France

Manmohan S. Arora, India
Mathematics Education into the 21st Century

2.5. Topic:

Non-school alternatives for mathematics education

John D. Volmink, South Africa
Non-school Alternatives in Mathematics Education

Sixto Romero, Spain
La Néccesité de Populariser des Maths: Une expérience à travers de la radio

Virginia Thompson, USA
FAMILY MATH: Linking Home and School

Jeff Evans, UK
Statistics and Numeracy for Adults - The Case for the "Barefoot Statistician"

2.6. Topic:

The mathematics demands of the Economy

Guida Maria Correia P. de Abreu / David William Carraher, Brazil
The Mathematics of Brazilian Sugar Cane Growers

Wang Chang Pei, China
Differences in Mathematical Education between Rural and Urban Areas in China

Howard Russell, Canada
The Generic Skills/Economic Development Project - The Mathematical Demands of the Economy

Bernhelm Booß-Bavnbek, Denmark
Risk Spreading in the Technological Society through Progress in Mathematical Modelling

2.7. Topic:

Mathematics education under different cultural constraints

S. K. Bamba, Ivory Coast
Critical Issues Concerning Mathematical Education in the Ivory Coast

Jens Naumann, FRG
Practical Aspects of Basic Mathematics Teaching in Senegalese Villages

Diana Rosenberg, Argentina
Knowledge Transfer from One Culture to Another

Munir Fasheh, West Bank
Mathematics in a Social Context

2.8. Topic:

Society as a source of ideas for mathematics teaching

Brian Hudson, UK
Global Perspectives in the Mathematics Classroom

Tadasu Kawaguchi, Japan
Mathematical Thoughts Being Latent in Various Artistic Activities

Diana Schultz, Australia
Projects in Real Life Integrated Mathematics in Teacher Education (PRIMITE): A Program for Both Student Teachers and Primary School Children

Joop van Dormolen, The Netherlands
Values of Texts for Learning Mathematics for Real Life

2.9. Topic:

How autonomous is the mathematics teacher?

Diane Siemon, Australia
How Autonomous is the Mathematics Teacher?

Paul Ernest, UK
The Impact of Beliefs on the Teaching of Mathematics
Kurt Kreith, USA
The Recruitment and Training of Master Teachers
John Suffolk, Zambia
The Role of the Mathematics Teacher in Developing Countries

2.10. Topic:
Ethnomathematics and schools
Gloria F. Gilmer, USA
Worldwide Developments in Ethnomathematics
Randall Souviney, USA
The Indigenous Mathematics Project: Mathematics Instruction in Papua New Guinea
George Eshiwani, Kenya
School Mathematics and Carpentry/Tailoring
Eduardo Sebastiani Ferreira, Brazil
The Genetic Principle Versus Ethno-Mathematics

Timeslot 3 (14.00 - 15.30):
Educational Institutions and the Individual Learner

3.1. Topic:
Individual and social learning motivations
Anne-Nelly Perret-Clermont / Mari L. Schubauer-Leoni, Switzerland
The Social Construction of Meaning in Math Class Interaction
Timothy E. Erickson, USA
Cooperative Learning in Mathematics: A Way to Engage All Students
Egon Mermelstein, USA
Humor and Dignity in the Mathematics Classroom: Complementary or Contradictory
Albrecht Abele, FRG
Social Learning and Mathematics Learning

3.2. Topic:
Cultural influences on learning
Analúcia Dias Schliemann / Nadja Maria Acioly, Brazil
Numbers and Operations in Everyday Problem Solving
Frederick Leung, Hong Kong
The Chinese Culture and Mathematics Learning
Kathryn Crawford, Australia
Knowing What versus Knowing How: The Need for a Change in Emphasis for Minority Group Education in Mathematics

3.3. Topic:
Are girls underprivileged around the world?
Erika Kuendiger, Canada
Mathematics - A Male Subject?
Jeanne Peiffer, France
The Nature of Mathematical Apprenticeship and its Implications for Women

Frank J. Swetz, USA
Cross Cultural Insights into the Question of Male Superiority in Mathematics: Some Malaysian Findings

Gila Hanna, Canada
Girls and Boys About Equal in Mathematics Achievement in Eighth Grade: Results from Twenty Countries

3.4. Topic:
Societal determinants of learning

Joan Bliss / H.N.Sakonidis, UK
A Cross Cultural Study of Children's Ideas about What is Really True in Four Curriculum Subjects

Gustav Adolf Lörcher, FRG
Learning Mathematics in a Foreign Language

Ali Rejali, Iran
Lack of Interest of Students for Studying Mathematics

Bernd Zimmermann, FRG
Mathematics for All *and* Teaching the Gifted

3.5. Topic:
The social arena of the mathematics classroom

Josette Adda, France
The Mathematical Classroom as a Microsociety

Tom Cooper, Australia
Negative Power, Hegemony and the Mathematics Classroom

Andrea L. Petitto, USA
The Structure of Mathematical Discourse among Teachers and Children in Elementary School

Terry Wood, USA
Whole Class Interactions as the Negotiation of Social Contexts within which to Construct Mathematical Knowledge

3.6. Topic:
Learning under difficult conditions

Arthur Powell / Marilyn Frankenstein, USA
Mathematics Education and the Needs of "non-traditional" Learners

Françoise Cerquetti-Aberkane, France
Teaching Mathematics in Special Classes for Children with Serious Difficulties in France

N. C. Taylor, South Africa
'Let them eat cake' - Desire, Cognition and Culture in Mathematics Learning

3.7. Topic:
Mathematics education in multi-cultural contexts

Raymond A. Zepp, Macau
New Directions in Research on Language in Mathematics

Ina Kurth, FRG
Learning Mathematics in a Foreign Language

Helen Watson, Australia
Mathematics Education from a Bicultural Point of View

Norma C. Presmeg, South Africa
Mathematics Education and Cultural Continuity

3.8. Topic:
Ethnomathematical practices

Salimata Doumbia, Ivory Coast
Sur les mathematiques dans les jeux traditionnels africains

Sergio Roberto Nobre, Brazil
Ethnomathematics - The Mathematics of the Most Popular Lottery in Brazil: 'Animal Lottery'

Jean Lave, USA
Mathematics in Two Contexts of Learning and Use: West Africa and U.S.

3.9. Topic:
Social construction of mathematical meaning

Paul Cobb, USA
Children's Construction of Arithmetical Knowledge in Social Context

Erna Yackel, USA
Small Group Interactions as the Negotiation of Social Contexts within which to Construct Mathematical Knowledge

Barbara Fresko / David Ben-Chaim / Miriam Carmeli,Israel
The Relationship of Class and Teacher Traits to the Learning Environment in the Mathematics Classroom

Timeslot 4 (16.00 - 17.00):

Mathematics Education in the Global Village

4.1. Hearing:
Which and whose interests are served by Mathematics Education
Questioners: Christine Keitel, FRG, and Yves Chevallard, France

4.2. Hearing:
How does Mathematics Education relate to destructive technological developments?
Questioner: Jens Nauman, FRG

4.3. Hearing:
Do mathematics educator know what they are doing?
Questioner: Jeremy Kilpatrick, USA

4.4. Hearing:
What are the challenges for ICMI in the next decade?
Questioner: David Wheeler, Canada

4.5. Hearing:
What can we expect from ethnomathematics?
Questioner: Ubiratan D'Ambrosio, Brazil

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(Readers are asked to notify the Secretary of any errors in this list)

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THE INTERNATIONAL STUDY GROUP FOR THE RELATIONS BETWEEN THE HISTORY AND PEDAGOGY OF MATHEMATICS

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THE INTERNATIONAL ORGANISATION

OF WOMEN

AND MATHEMATICS EDUCATION

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Professor Anna Zofia Krygowska

The death occurred in May, 1988 of Anna Zofia Krygowska, who for so many years has played a leading role in mathematics education. Her influence extended far beyond her native Poland. For example, she was a plenary speaker at the first ICME and played a significant rôle in later Congresses, she contributed to several of the UNESCO New Trends in Mathematics Teaching volumes, and also she was Honorary President of the Commission Internationale pour l'Etude et l'Amélioration de l'Enseignement des Mathématiques.

Madam Krygowska and her work will long be remembered with respect, gratitude and affection.

A.G.H.

CO-OPERATION IN MATHEMATICS EDUCATION IN THE SOUTHERN AFRICAN REGION

There is a natural affinity between the countries and the people of Botswana, Lesotho and Swaziland, jointly referred to as BOLESWA, and there has been considerable consultation at all levels over the years. Originally there was one University for the three countries, situated at Roma in Lesotho, and this has now been succeeded by three national Universities. Similar courses are run for Diploma, B.Ed.Sc., B.Sc.Ed., M.Ed., PGDE and In service work. An aim is to have a well defined research policy with a regional bias, and to make research findings more widely known. There is a Boleswa Educational Research Journal, and an Educational Research Association in each country. A research seminar was held in Lesotho recently, well attended by educators from the three countries, including policy makers from the Ministries of Education.

Having worked together in the past, it has been relatively easy to continue co-operation in many fields. For example, the three countries take Cambridge Overseas School Certificate, COSC, top grades gaining entry to Higher Education; the Junior Certificate examination taking place at the end of Year 3 secondary school was formerly a common examination; and teachers and mathematics educators from the three countries have jointly written a series of secondary mathematics texts, PRISM, which is widely used. Each country has its own Maths and Science Associations, and each runs a Maths Science Fair, with a regional one planned for next year, in conjunction with a workshop for Science and Mathematics Teacher Associations.

In 1985 there was a regional seminar in Lesotho on mathematics and science education, to examine the common problems in teacher education in the region, and to look at the present and projected activities of curriculum development. In 1987 a regional workshop was held in Gaborone on learning difficulties and teaching strategies in secondary school science and mathematics, with keynote speakers from the Netherlands, UK, USA and Sweden, and 90 participants from eight nearby countries. The general objectives of the Conference were to discuss recent developments in the field of maths and science education, and to study the impact these should have on the planning and execution of secondary improvement programmes.

There is also the wider region of the nine countries of SADDC, Angola, Botswana, Lesotho, Malawi, Mozambique, Tanzania, Zambia, Zimbabwe and Swaziland, all except Angola and Mozambique previously following the British education system. Each year there is a Southern African Mathematical Sciences symposium hosted by Universities in different countries. This Association, SAMSA, was established for Mathematics departments to present and disseminate research findings, and now in alternate years also has a Mathematics Education workshop. Even though Universities in the region are separated by long distances, these opportunities for the exchange of ideas are very valuable and enjoyable, with the added pleasure of seeing other countries, giving cultural as well as mathematical exchange.

Regional meetings can only take place when external funding is available, and the region is indeed very fortunate in this regard, with financial support from various donor agencies. A very interesting and enriching aspect of regional meetings is their international nature, with participants from Africa and also from America, Europe and Asia, as expatriate staff still have input into the system.

Hilda Lea
Faculty of Education
University of Botswana
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ASSOCIATIONS FOR MATHEMATICS EDUCATION

A meeting for representatives of national associations will be held at ICME6. It is being organised by Professors Abrantes (Portugal) and Becker (Fed.Rep. Germany). Details will be available in Budapest.

Please try to ensure that your national associations are represented.

There does not appear to be an up-to-date list of associations in existence. Please therefore, let Professor G. Becker, Universität Bremen, FB3, 2800 Bremen 33, Postfach 33 04 40, know the name and address of any such associations in your country.

ACKNOWLEDGEMENT

This Bulletin has been prepared with the help of a grant from UNESCO.

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