Chapter 21: Popularization: Myths, Massmedia and Modernism

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ABSTRACT

This chapter looks critically at the popularization of mathematics, which is distinguished from the public understanding of mathematics. After a brief review of the history of popularization materials, the intended audiences of projects are considered. A selection of popularization projects is discussed, chosen to illustrate the possible range of audiences, objectives and media. Two conclusions are reached. First, for high quality popularization productions directed at a mass audience, collaboration among media, mathematics and educational professionals is needed. Second, most projects are not evaluated. Systematic data on effectiveness is needed.

The second part of the chapter explores myths about mathematics, and in particular negative myths that are widespread in society, circulated through the massmedia. It is argued that these myths are supported by modernism in the philosophy of mathematics and mathematics. Also, that the source of the maths myths is the stereotyped experience of school mathematics shared by many. It is claimed therefore that to eradicate negative maths myths will involve the reform of school mathematics. This raises the issue of aims for the popularization of mathematics and strategies for achieving them. The chapter concludes with questions for further research on the topic.

1. THE POPULARIZATION OF MATHEMATICS

One of the clarion cries in the late 20th century west is for the popularization and public understanding of mathematics and science. These great engines of modern civilization are crying out for human resources to supply the always increasing needs of education, science, medicine, industry, commerce and administration in the modern world. Couple this with the commonly negative perceptions of mathematics, and in some countries the unpopularity of science and technology too, there is a need for the popularization of these subjects. In particular, there is a need for the popularization of the language of science, technology and computers: namely, mathematics, as well as an increased public understanding of the subject.

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An immediate question arises: What is the popularization of mathematics and what does or might it mean? The valuable ICMI study on the topic (Howson and Kahane 1990) suggests four key features of the popularization of mathematics.

- It consists in sharing mathematics with a wider public
- It includes encouraging people to be more active mathematically
- It must provide mathematical activity in freedom, not by compulsion
- It brings mathematics into human culture, providing mathematics for all.

Implicit in these features is another goal which is worth making explicit: to improve the popular image of mathematics and popular attitudes to it.

The popularization of mathematics should be distinguished from another overlapping area of study, the public understanding of mathematics. By analogy with the public understanding of science this includes public:

- Knowledge of the facts, skills, concepts and strategies of mathematics.
- Knowledge and beliefs about the role of mathematics and its relationships with science, technology, culture, history, commerce, industry and other areas of human knowledge and activity.
- Beliefs about the nature of mathematics as a discipline, the activities of mathematicians, the means of testing and warranting mathematical knowledge and its status.
- Distortions of knowledge and misconceptions in the above areas.
- Knowledge and beliefs about the teaching and learning of mathematics and its assessment.

The public understanding of mathematics is concerned to discover and describe public knowledge and beliefs about mathematics, whereas the central concern of the popularization of mathematics is to enhance public attitudes to and involvement with mathematics. However, improving the public's knowledge of mathematics and its role in education and society, may also lead to the popularization of mathematics.

Although the popularization of mathematics takes place against widespread negative images of mathematics and mathematicians, there are also many features of modern life that provide support for it.

- The public love of puzzles and games, often with a mathematical component.
- The growing interest and fascination with computers and computer based activities including games and simulations, computer-generated patterns and fractal geometry, virtual reality and the information superhighway.
- Press interest in breakthroughs in mathematics and science, as the media coverage of Andrew Wiles' proof of the Fermat Conjecture and interplanetary exploration showed.

- Increased interest in 'edutainment': knowledge and information presented as entertainment, such as the growing range of CD-ROM titles and TV quiz and puzzle shows.
- Reform movements worldwide in mathematics teaching aimed at making mathematics more accessible and the learning experience more active, enjoyable and effective.

These spontaneous areas of interest and independent activities suggest that developments and projects for the popularization of mathematics can draw upon many media, artefacts and forms of communication. The following categories are indicative of some of the means that have been so employed:

- **Celebrations, festivals and events,** including well publicized annual mathematics weeks; mathematics months, and mathematics years, such as the year 2000, the International Year of Mathematics. These can be local, regional, national and international. They are usually coordinated with broadcast media launches, exhibitions, lectures, competitions and other programmes of events, including environment related activities, such as mathematics trails
- **Exhibitions,** including mathematical exhibits in science or other museums (e.g. the Italian exhibition of Mathematical Machines organised by M. Bartolini-Bussi); touring mathematics shows; 'hands-on' activity or exploratory exhibits; displays of mathematical toys, games and puzzles; displays of mathematical books and materials at book shops or in libraries or in exhibitions.
- **Lectures,** including mathematics enrichment lectures, masterclasses and visiting mathematician speakers, lectures on the history of mathematics, ethnomathematics, games, puzzles, demonstrations of mathematical apparatus; calculating prodigies; school mathematics evenings for parents.
- **Computing and Computer Activities.** Popular computer activities include games, recreations and simulations; software for generating or exploring mathematical patterns, symmetries, fractals, etc.; programming and other mathematics computer activities; bulletin boards for sharing and discussing mathematical ideas and challenges.
- **Games, manipulatives, toys and puzzles** with mathematical content such as mathematical board games; cryptanalysis and code kits; calculators and electronic learning toys.
- **Print materials** include books of mathematical games, puzzles and recreations; children's fiction with mathematical content; popular books on mathematics and its history, philosophy and cultural contexts; puzzle 'corners' and features in magazines and newspapers; mathematical magazines and serial publications for young people; posters with mathematical content and patterns. For example, in France there are some very good comics 'bande dessinee' for educated adults treating

mathematical themes such as *Les aventures d'Anselme Lanturlu* (about non-Euclidean geometries) by the physicist Jean Pierre Petit, which was a popular success in the late-1970's and 1980's.

- **Audio-visual and broadcast media** including TV programmes with mathematical puzzles and games; educational programmes for children with mathematical content, cartoons and films with mathematical content, news updates on mathematical developments in science programmes; programmes about mathematicians and the history and philosophy of mathematics; mathematical radio programmes; music and songs with mathematical content; parent education programmes; adult education programmes, both advanced and numeracy orientated (Chapter 20 in this volume by Jungwirth *et al.* treats adult numeracy).

1.1 The History Of Popularization Materials In Mathematics

Popularization materials have been around for a long time, in the form of problem books and mathematical games. Singmaster (1994) argues that these originate in recreational mathematics which is intended to be both fun and popular, and can be traced back at least 4000 years to the Rhind Papyrus of North Africa (Egypt). This contains a problem leading to adding 7 + 49 + 343 + 2401 unrelated to the other problems in the papyrus and most likely inserted for recreational purposes. It is almost analogous to the following problem found in Fibonacci and in medieval Britain but reproduced here from a present day book of children's rhymes.

> As I was going to St. Ives,
> I met a man with seven wives,
> Each wife had seven sacks,
> Each sack had seven cats,
> Each cat had seven kits:
> Kits, cats, sacks, and wives,
> How many were there going to St. Ives?
>
> (Kincaid and Kincaid 1975: 58)

Singmaster's review indicates how extensive the history of recreational mathematics is, and thus implicitly, how important a role it has played in the popularization of mathematics. If there has been a modern shift in the field, it has been towards more systematic attempts to popularize mathematics, and the direction of such attempts towards specific target audiences, rather than simply making recreational resources available to the public, and especially, enthusiasts.

1.2 Audiences

One of the central issues that arises in a consideration of the popularization of mathematics is the question of audiences. Thus the ICMI study asks in a heading 'To whom, what, by whom?' (Howson and Kahane 1990; p.11). Another question may be appended: 'To what end?' A number of different audiences for projects for the popularization of mathematics can be imagined. For each popularization project it is necessary to ask: What are the objectives and desired outcomes of the popularization project? Who is the intended audience? What is their relationship with mathematics? Which of their characteristics should be accommodated in such a project? What kinds of topics or experiences are needed to achieve the planned outcomes for the target audience?

Table 1 below offers an indicative set of objectives for possible popularization projects, and target audiences.

OBJECTIVE OF POPULARIZATION PROJECT	TARGET AUDIENCES
1. To show mathematics as a creative and exciting subject, rich with patterns and connections to the world of the child	1. Younger children.
2. To show mathematics as a creative and exciting subject, rich with pattern and applications, exemplifying how it can be communicated to children	2. Primary school teachers, parents.
3. To involve in mathematical activity, develop a fascination with the subject, and encourage further study of mathematics	3. Older children who like mathematics.
4. To overcome traditional negative views of mathematics as a cut-and-dried, uncreative subject accessible only to a minority	4. Older children who are neutral to or dislike mathematics.
5. To show how mathematical thinking permeates everyday and shopfloor life and current affairs	5. Adult workers.
6. To broaden knowledge of mathematics as a central element of culture, art and life, present and past	6. Retired persons.
7. To involve in challenging and creative mathematical problem solving and show that it is open to all	7. General public.
8. To show how mathematics permeates and underpins science, technology and all aspects of human culture	8. Informed citizens.

Table 1. Possible Objectives for Popularization Projects and Target Audiences.