

Round Table D: July 9, 1992

LET'S CULTIVATE MATHEMATICS!

organized by Y. Chevallard¹ and A. Rouchier²

Introductory Remarks

by Yves Chevallard

Let me begin with a few remarks in order to outline the topic of our round table discussion. The title – *Let's Cultivate Mathematics!* – gives a good idea of our main concerns. However, I would like to stress some hidden aspects of the situation to which it implicitly refers.

(1) In today's societies mathematics has come to be one of the main constituents of the societal machinery. This point should be carefully appraised. For instance, mathematics as a driving force had not as yet become central in 18th century European countries. It certainly played a key role in some branches of economic activity, such as commerce, but it had not achieved the vital importance that it has gained today. In present-day societies, mathematics is indeed an all-pervasive ingredient which has lodged itself in every nook and cranny of the social structure. If we could cut off mathematics just as we can cut off electricity, very little would survive for long. For our societies run on mathematics as they run on electricity. I shall not address the question of why this is so, or whether it could be otherwise. I take reality as it is, whether we like it or not. And I shall emphasize rather an apparent paradox, which will lead us to the main problem we are currently confronting.

(2) The part played by mathematics in yesterday's societies was not impressive, but nevertheless mathematics had achieved *cultural visibility*. What I mean here is that people generally knew that mathematics was underpinning at least *some* aspects of social activity. All European languages have apparently recorded this state of affairs, using different expressions, e.g., in English, "I don't understand the mathematics of it".

(3) The gap between the man in the street's vision of society and the reality of social functioning was brought about by two overriding factors, the first of which is the industrialisation and the subsequent rationalisation of our societies. In this long-term process, the traditional mathematics of commerce, accounting and banking was overshadowed by the much less visible mathematics of industry and technology, which went deeper and deeper into the inner recesses of the social machinery – the division of labour, which conceals from us the true structure of society, and the inability of culture to provide us with an image of social reality that could compensate for this loss of lucidity. This made the man in the street unaware of the growing role of mathematics as a tool of production for society and, consequently, of the growing mass of mathematics "crystallised" in the whole gamut of objects that surround us in daily life.

A second factor has had equally significant consequences: compulsory schooling. This of course is a major fact of our times. However I would like to single out one aspect which seems most relevant to our topic. School was thought to be a vantage point from which society could be revealed through the study of a number of fields of knowledge. From then on, generations of budding citizens met head-on with mathematics, but this encounter took

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place under very special conditions. Mathematics was locked away in school; school mathematics, as we may call it, was cut off from its social roots, and its social significance and utility gradually disappeared. Mathematics thus became a school-bound reality.

(4) The intention behind mathematics at school was twofold. On the one hand, school was supposed to provide society with the necessary scientific workers, i.e., mathematics for the few. In this respect it succeeded rather well, although in the long run its effectiveness has slowly but steadily declined, in relative terms. On the other hand, it was also the task of school to help culture keep pace with the evolution of society. That was mathematics for the many, and this is where the problem arises. The mission assigned to school was to generate and spread a vision of society more faithful to the changing nature of our societies. In this respect it failed. The gap between the two cultures, one supposedly “humanistic”, the other “scientific”, gave way to a permanent culture lag, a fact almost unknown, at least in some circles, for instance in the Age of Enlightenment.

(5) We have now arrived at a turning-point in the history of our science-based societies. These depend heavily on technology, science, and therefore mathematics. But science, mathematics and technology have not yet gained the recognition that would allow them to live a peaceful life in the realm of culture. While their *social relevance* is high, their cultural attractiveness remains very low. In the long run, this conflict is sure to lead to the situation that some of our countries already experience – a situation marked not only by the shortage of mathematics teachers, but also by a shortage of “scientific workers”. The current exclusion of mathematics from the realm of culture (regarded both as a body of attitudes, values, representations and knowledge, and as a selection of these) makes it difficult for anyone, especially among the youth, to be spontaneously attracted to mathematics.

(6) To sum up: mathematics remains secluded, first at school, then in scientific communities. Now the problem is that mathematics, as a body of knowledge and a tool for action, cannot live long in such a splendid isolation. It has to be supported from outside, that is, it has to receive cultural support by being reinstated into culture. Society as a complex whole has *needs*, which include mathematical needs. Cultural unawareness of these needs is a blatant fact which endangers the very development of present-day societies. Let me add here that such a problem arises in every hamlet of the “Global Village” in so far as, willy nilly, the Western model of development is being extended to the whole planet.

(7) The *mathematics awareness* we should try to spread meets with a difficulty of which we will not easily rid ourselves. There is no evident relation between society’s mathematics needs and those of the individual. Mathematics needs can be felt at the level of society as a complex machinery. But, as a consequence of the division of labour, they usually remain foreign to the individual. This is why the man in the street can so easily ignore mathematics.

(8) However, the process of separation between the needs of society and those of the individual can never be totally complete. More and more people, as individuals, and especially as professionals, are personally affected by the growing presence of mathematics around us. Many are very likely to be confronted with personal mathematical needs at different levels of sophistication. Now a new problem arises. Cultural ignorance of mathematics impedes the mere recognition of these mathematical needs. Thus, we are taken back to the central question of our round table: how can we help to increase cultural awareness of mathematics as asocial reality – not only for the few, but indeed for the many?