

Relevance of mathematics to other branches of science

I enjoyed going through the special section on Mathematics¹. For obvious reasons I could especially empathize with the views expressed by Desiraju and Nanjundiah.

What surprised me, however, was that none of the authors has even marginally referred to the view that 'by giving so much emphasis on mathematics, science seems to be losing sight of the wider context of its vision'². Perhaps this only reflects the extent of David Bohm's fall from grace!

1. *Curr. Sci.*, 2005, **88**, 360–423.

2. Bohm, D. and Peat, F. D., *Science, Order and Creativity*, Routledge, London, 2000.

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Upon going through the special section I remembered an incident, which I witnessed few years ago. I was then a member of a committee empowered to select a young chemist for a national level award. About 12 promising scientists presented their work with the proper introduction and background, philosophy of the Institute they work, philosophy of chemistry or science in general, etc. At the end of it all, the Chairman of the committee men-

tioned that everything was fine but there was no chemistry in any of the talks! Naturally, no award was given that year!

To me, in this special section, there is everything but Mathematics (except one article, p. 405). As a member of the editorial board of *Current Science* I must welcome this effort, however, I wish this special section was named as 'Mathematics and Philosophy' or 'Mathematical Philosophy' or the like.

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The special section on Mathematics is outstanding. The role of mathematics *vis-à-vis* the physical world, and its effectiveness (unreasonable or otherwise!), are deep questions that should certainly exercise not only scientists and technologists but also every thoughtful person. The articles are uniformly excellent, instructive and thought-provoking. Together, they constitute a most valuable collection of essays on almost all facets of this important topic.

I would like to mention a couple of very pertinent additional references in this regard for the benefit of some readers who may perhaps be unaware of them. An incisive discussion is presented in J. D. Barrow's book, *The World Within the*

World (Oxford University Press, 1988). Chapters 5 ('Why are the laws of Nature mathematical?') and 6 ('Are there any laws of Nature?') deal with several of the issues involved in a very readable fashion. Evidently, the author thought the subject was quite important, because he returned to it a few years later in a full-length book, *Pi in the sky... Counting, Thinking and Being* (Oxford University Press, 1992). I would recommend these books to anyone with an interest in the basic mystery of whether mathematics is in our minds or whether it is 'really out there'.

It seems to me that each individual who thinks about this question presumably evolves a personal working philosophy. Without getting into metaphysical discussions which are well beyond my purview and competence, my own opinion (for what it is worth) is that the 'truth' probably lies 'in between', and that the question of whether mathematics is subjective or has objective reality is in itself a loaded one that cannot have a completely unambiguous answer. The discussion will presumably go on, much like the discussion of whether; in the ultimate analysis, 'the continuum is more fundamental than the discrete', or the other way around.

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Phytomining of gold

The Kolar Gold Fields (KGF) in Karnataka, locally known as Bangarapet (city of gold), was a premier gold mining area in India and was operated by the Bharath Gold Mines Limited (BGML). The mines have a recorded history of nearly 200 years of operation. Owing to a faulty process of extraction, defective and outdated technology and deep mining, there has been an escalation in the production cost of gold over time rendering it uneconomic. The production¹ during the first decade of the last century

was around 45 g/t while during 1999, it was approximately 3 g/t. Hence the union government decided to close the mines. The closure of the mines eventually created a catastrophic impact on the inhabitants of KGF. Before the closure of the mines, the government was thinking about rehabilitation measures and many expert committees visited the place and submitted alternative proposals to continue mining activities. A team headed by C. P. Nair, Chief Technical Advisor, Ministry

of Steel and Mines and K. V Krishnamurthy, Deputy Director of Geological Survey of India suggested² an unmined parallel reef in 1990. One of the panels had even proposed a scheme to recover gold from larger residual dumps (mounds of tailings) that had accumulated over the years³. Studies have shown that there are about 33 million tonnes of dumps accumulated over the years which may be a source of 24 tonnes of gold. The use of phytomining technology may prove to be a