

# The future of mathematics in Pakistan

By Qaiser Mushtaq

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**S**INCE we have had various references to pure mathematics and applied mathematics in the country lately, and in view of the policies of the Higher Education Commission (HEC), which recently echoed an influential viewpoint, I thought of adding to the noise, confident that most people in the HEC will not budge despite the fact that this concerns one of the largest communities in the education sector and that it will eventually rather affect science adversely in Pakistan.

The English educational system that I have partly experienced involved increasing specialisation. One progressively gives up disciplines, often at an early age, and the system progressively gives up its children, with a tiny percentage still involved at the end. Students may give up history and geography at 13, English at 15 and the sciences at 17. Applied mathematics, however, is a subject which a student learns only in the final year of his/her undergraduate degree. 'Applied mathematics' in the UK means Electromagnetism, Waves, Vector Analysis, Lagrangian and Hamiltonian Mechanics, Special Functions, Quantum Mechanics, Special and General Relativity. Anyone who mentions modelling would be asked to leave the campus.

Students usually dislike subjects in mathematics due to its intuitive and non-rigorous approach. Where pure mathematics has proofs, applied mathematics has alibis, and one faces continual appeals to the intuition, which students usually lack. Ask any applied mathematician how flotation works, given that water is not compressible, and watch him gibber. What you will sometimes find is that they confuse flotation with barometric effects, which is really funny.

The Pakistan system has changed. We now play 'broad spectrum' games orchestrated by people who by definition and selection are least able to conduct them.

The definition of applied mathematics has changed in Pakistan. A couple of years ago, I asked in a staff meeting why none of the sort of courses recognised globally as 'applied' were taught here? The answer was, as far as I could make out, that a general shift in opinion had occurred. Our situation reflected a consensus view, shared by most modern institutions. Accepting this, I did try to substantiate using prospectuses available in the libraries in some well-known universities in Pakistan. Let us say, diplomatically, that I still cannot see why we teach almost no physics in our applied mathematics programmes, and could not find an institution with a programme that's anything like we

have, for instance, at the Quaid-i-Azam University (QAU). Even though I accepted what I was told in silence, my opinion remains that there is something wrong and false about the Pakistani version of applied mathematics and that this is why it becomes so difficult to mount valid third and fourth semester M.Sc/M.Phil options in applied mathematics — the students are just not familiar with the physics or the techniques.

But the fashion is now to talk about 'applicable mathematics'. In this age of the accountant, every other person is claiming that their own work is commercial, useful, applicable, etc. The biggest conman I ever met probably worked in 'fluid mechanics' at the QAU. They claim their methods are of vital importance to anything that deals with any form of liquid, especially blood and urine, without providing any kind of evidence whatsoever.

It should be a matter of concern that every third thesis or dissertation is written on a topic in fluid mechanics — one of the 3,525 sub-branches (according to 2000 *Mathematics Subject Classification*) of mathematics. If we continue pampering research through dissertations and theses in this area alone and consequently keep on producing specialists in a particular area, what will happen, say, in the next five years?

Conmen are endemic in modern universities and there are many subjects which are based on little more than politically correct prejudice. For example, most people accept the assertion that there is such a discipline as 'mathematical modelling', that there are people able to apply mathematics, and that they will make for better researchers and lecturers. This is a part of a multi-million rupee academic racket. I have never been able to obtain a shred of evidence to support such views despite earnestly attending a whole series of seminars and workshops and wasting much time looking at journals, books and papers. I would now run a mile rather than engage a 'mathematical modeller' in any kind of academic debate. There is no such discipline. Every mathematician uses models, if there is a coherent subject with firm foundations which we might call 'modeling', I have not yet come across it, despite tripping over 'mathematical modellers' every time I leave the office.

But in Pakistan, one is used to speaking in code. For example, what does one make of the non-mathematician's comments about departmental emphasis? I have not noticed it. In the same way, we read or hear that "it had been agreed" in a "committee" that emphasis should be given to the applications of science rela-

ted to the needs of the nation. Really? By whom? How come most of the experienced mathematicians were not a part of the discussion and hence of such a verdict? HEC and the Education Ministry even issued a policy document without our knowledge, permission or consent on the basis of perceived shortness of time. Is it just me that gets up in arms about this sort of thing?

Modelling here seems to mean the manipulation of partial differential equations to solve problems in fluid dynamics. This is of absolutely no interest to "the needs of the nation".

There is no doubt that such mathematics is potentially useful. But what could we do in, say, oil field modelling, which some oil company did not already do years ago? Such work involves high-powered machines. Where would we get them? Who has the expertise to use them? Who has any kind of track record in this sort of work? The same applies to fishery modelling. There are whole university departments engaged in it. The US has about a 100 years start on us and it has thousands of personnel and vast amounts of equipment too. What are we going to do with Pakistan's tiny fishing industry that they have overlooked? Get Real!

Our work here does not need to be confrontational. Very few people here have any experience of industrial problems though nearly everyone spouts on about them. If we are really going to have some kind of intelligent debate on what areas of mathematics might be useful to Pakistan, we are going to need more than an ill-informed wish list or the kind of sneak tactics which apparently commit us to courses of action which have never been discussed with non-cronies, and just appear magically, like NUST's Camp and QAU's Fluid mechanics group laboratory.

If you give me a fraction of what you are spending on applied mathematicians, I could probably come up with a distinguished algebraist to swear that we urgently need an institute to research K-theory.

There are areas in which we could be more useful in Pakistan, but they are low-key, bread and butter things, which this country lacks and really does need — stuff on acceptance sampling, quality control, decision making, optimisation, system organisation, communications and networking. Not really applied mathematics at all ... more (how shall I put this ...?) PURE. ■

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