

anniversary of its founding and as part of the celebrations it was honoring sixty eminent men of letters and science. The list included Einstein, Heisenberg, Piaget and Jung. They were also honoring Hardy. Hardy gave a series of lectures that later came out as a book entitled *Ramanujan: Twelve lectures on subjects suggested by his life and work*. Hardy said at the beginning of his lectures, and I quote from Kanigel's book:

"I have to form myself, as I have never really formed before, and to try to help you to form, some sort of reasoned estimate of the most romantic figure in the recent history of mathematics, a man whose career seems full of paradoxes and contradictions, who defies

almost all canons by which we are accustomed to judge one another and about whom all of us will probably agree in one judgement only, that he was in some sense a very great mathematician".

And then Hardy began to speak about his friend Ramanujan.

Kanigel tries to do the same. Hardy concentrated on the technical aspects of Ramanujan's work. Kanigel in his own meticulously researched style tells us more about Ramanujan the man.

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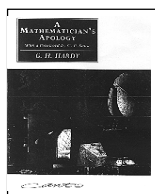
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## A Mathematician's Apology

### Mathematics and Creativity

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**R Vittal Rao**



*A Mathematician's Apology*  
 With a Foreword by CP Snow  
 G.H. Hardy  
 Cambridge University Press, 1993  
 pp153, Rs. 175

Every creative person – whether a painter, a poet or a scientist – reflects, at some time or the other in his life, on whether his work is worth doing and why he does it. It is these very questions that Hardy – one of the outstanding mathematicians of this century – takes upon himself, as a mathematician, to

answer, and “put forward an apology for mathematics”. The book has been reviewed, discussed and debated by several mathematicians. It is natural that the author's personal likes and dislikes play an important role in answering these questions. One must keep this in mind while reading the book. It is quite likely that a reader will get involved (as this reviewer did) in an argument and disagree with the author every now and then while reading through the book!

Another crucial aspect that a reader must keep in mind is that Hardy authored this book while he was in his sixties and felt that his creative powers were on the decline. No wonder, then, that he begins the book with the words, “It is a melancholy experience for

a professional mathematician to find himself writing about mathematics”. Hardy believed in doing mathematics and not writing or talking about mathematics. C P Snow, in his foreword, aptly writes, “*A Mathematician’s Apology* is, if read with the textual attention it deserves, a book of haunting sadness”.

Hardy quickly tackles the question of *why he does it* by the argument that “I do what I do because it is the one and only thing that I can do at all well . . . It is a tiny minority who can do anything *really* well, and the number of men who can do two things well is negligible”. The sadness of his age having drained his creativity haunts him when he writes, “No mathematician should ever allow himself to forget that mathematics, more than any art or science, is a young man’s game”. This view has been debated for years. “I do not know an instance of a major mathematical advance initiated by a man past fifty”. While one may generally agree that with the advance of age, a mathematician does lose his sharpness, his creativity, yet as another outstanding mathematician Mordell says “there are still many consolations . . . find pleasure in thinking about some of our past work . . . sometimes completely changing the exposition of classical mathematics . . . (We can still be of service to younger mathematicians)”.

Hardy attempts in detail to analyse the question of whether his work is worth doing. He puts forth several arguments. The harmlessness of mathematics, its *profitability*

or otherwise, the permanence of mathematical achievement are some of the ideas that Hardy touches upon. To him the patterns created by a mathematician are more permanent than those of a painter or a poet since those of a mathematician are woven with *ideas*.

Hardy is very emphatic that the mathematical patterns “must be beautiful – there is no permanent place in the world for ugly mathematics” – though, it “may be very hard to *define* mathematical beauty, but this is just as true of beauty of any kind”. To bring home this point, Hardy discusses some examples. He is somewhat handicapped by the fact that he must choose examples that are very simple and intelligible to a nonspecialist. He chooses to discuss the aesthetic appeal of the infinitude of primes and is thrilled by the “very high degree of *unexpectedness*, combined with *inevitability* and *economy*”. Hardy is not the type who considers problems involving enumeration as *real* mathematics – “enumeration of cases, indeed, is one of the duller forms of mathematical argument”. A real mathematical proof, according to Hardy, should be like a “simple and clear-cut constellation, not a scattered cluster in the Milky Way”.

Hardy shows his strongest prejudices when he discusses the *usefulness* of mathematics. His views will certainly be debated for ever. Some glimpses of his views can be found in the following words: “. . . even Littlewood could not make ballistics respectable, and if he could not who can?”, “The ‘real’



mathematics of the real mathematicians, the mathematics of Fermat and Euler and Gauss and Abel and Riemann, is almost wholly 'useless'. Hardy's strong dislike for *usefulness* or application of mathematics, in particular, and science in general, stems from his obsession with their possible use in war. For instance, he observes, "But science works for evil as well as for good (and particularly, of course, in time of a war); and both Gauss and lesser mathematicians may be justified in rejoicing that there is one science at any rate, and that their own, whose very remoteness from ordinary human activities should keep it gentle and clean". Should Hardy be alive today he will surely be a sad man to see the military applications of *real* mathematics of the *real* mathematicians!

Many of Hardy's views are too harsh and sweeping to be acceptable. His views on usefulness of mathematics discussed above is a good example of this. To cite just one more, he writes, "—good work is not done by *humble* men".

It is very hard to believe that Hardy felt, as a boy, no passion for mathematics (Section 29)

and thought of mathematics more in terms of examinations and scholarships. This is in complete contradiction to the general belief that most great mathematicians are born and not made, and their interest develops and their talent shows up from a very young age.

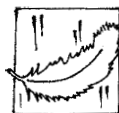
Hardy's beautiful essay makes very interesting reading, giving glimpses of the mind of an intellectual, saddened by his loss of creativity, and proud of his being a *real* mathematician. It must be read not only by mathematicians and scientists, but also by historians, students of psychology and literature.

The book has a lengthy and very interesting foreword (which is almost a brief biography of Hardy) by C P Snow, Hardy's friend of long standing.

To sum it up, we may borrow a phrase from Hardy, and rate the book as of *Bradman Class*, and to borrow Snow's words, should be read *with the textual attention it deserves*.

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Why does this magnificent applied science, which saves work and makes life easier, bring us so little happiness? The simple answer runs: Because we have not yet learned to make sensible use of it.

*Albert Einstein*