G. H. Hardy
(1877-1947)

Professor G. H. Hardy, who died in November 1947, was probably the greatest British mathematician of his generation, and one of the greatest in the world. Like many great men, he held views and did things which do not easily go together in the lives of ordinary men.

He was a very pure mathematician. Much of his work was on the theory of numbers. For example he and his colleagues tackled the problem of the number of partitions of a given number. Consider the number three. You can express it as 3, as 2 + 1, or as 1 + 1 + 1, that is to say split it up in three ways. Four can be written as 4, 3 + 1, 2 + 2, 2 + 1 + 1, or 1 + 1 + 1 + 1, that is to say in five ways, and five in seven ways. But how can we find an expression for the number of partitions of any number? He finally arrived at the formula, which is fairly complicated. He then tackled similar problems, such as the number of ways in which a number can be broken up into a sum of a given number of squares, cubes, and so on.

If anyone told him that such work was completely useless, he was the first to agree. He boasted that his mathematics had never helped to kill a single man, and stated that mathematics were something like cricket, worth doing for its own sake. He was an intense admirer of cricket and cricketers. He would admit that various mathematicians had been in the first class. But he put half a dozen or so of them in what he called the Hobbs class, after the great Surrey cricketer. In actual fact his boast was untrue. To take one single example, there is a function called Riemann's Zeta function, which was devised, and its properties investigated, to find an expression for the number of prime numbers less than a given number. Hardy loved it. But it has been used in the theory of pyrometry, that is to say the investigation of the temperature of furnaces. And blast furnaces play a very important part in modern war.

Even cricket has its social function. For example in spite of the strong resentment aroused by Larwood's bowling, it has certainly cemented friendship between Britain and Australia; and the prowess of Indian and West Indian cricketers has made some Englishmen who would not otherwise have done so respect members of darker coloured races. Hardy's pure mathematics had a social function of this kind. In 1913 an unknown Indian clerk, Ramanujan, sent him a letter containing about a hundred mathematical theorems. Hardy got him over to England, and he became the first Indian fellow of Trinity College, Cambridge, and later of the Royal Society.

Unfortunately he got tuberculosis. As he lay dying of it, Hardy visited him. He asked Hardy for the number of his taxicab. Hardy replied «1729, not a particularly interesting number». «What, replied Ramanujan, don't you realise that it is the smallest number which can be expressed in two different ways as the sum of two cubes?» ($10^3 + 9^3$ or $12^3 + 1^3$). Or so the story goes. Hardy is alleged to have said that Ramanujan was on terms of personal friendship with every number less than 10,000.

In spite of this attitude to this profession, which many readers of this article will regard as futile and reactionary, Hardy was a staunch opponent of what he regarded as injustice and superstition, a socialist and a trade unionist. I remember him making a recruiting speech for the National Union of Scientific Workers, which was of course a Trade Union up to 1927, and as the Association of Scientific Workers, is one again. He argued that science and mathematics were worth doing for their own sake. But he went on to say that although our jobs were very different from a coalminer's, we were much closer to coal miners than to capitalists. At least we and the miners were both skilled workers, not exploiters of other people's work, and if there was going to be a line-up he was with the miners.

The idea of art for art's sake or mathematics for mathematics' sake is an incomplete idea. But it is very much better than idea of art for money's sake, or mathematics for engineering's sake, no matter how the engineering is to be used. If you really believe in art for art's sake you will soon want to change things so that everyone who wants can get a chance to practise art and to enjoy it. That means working for a society where everyone has the necessary leisure and means, in fact for socialism. That was as far as G. H. Hardy got.

The next stage is reached when the artist realizes that his art can become a weapon for socialism, and be all the better for it. Men like William Morris, Alan Bush and, in his early plays, Bernard Shaw, got to this stage. It is certainly harder for a mathematician to do so, because mathematics only appeal to the emotions of a few people, and can only be used directly for socialism after socialism has been won.

Though I disagree with Hardy's attitude I regard it as one-sided rather than wholly wrong. It is right that every skilled worker should take pride in his or her work, particularly when it is not done to increase someone else's profits. Hardy spent his life devising intellectual tools, which he tried out on the easiest material to hand, namely «pure» numbers. Other people have used these tools for the study of the mechanical systems such as telephones, and living ones, such as brains. To take an example from my own work, I have just used part of the theory of the partitions of numbers to analyse family records to see whether, on an average, certain diseases occur more often among the later born members of a family than the earlier ones.

I happen to be one of those who find an intense aesthetic pleasure in mathematics quite apart from its applications. I quite realise that this is not enough. But I also realise that those who enjoy it most are likely to do it best. So I do not feel that Hardy's attitude was wholly wrong, and I mourn a man whom I not only liked personally, but whose writings gave me some of the emotions which others derive from classical music.

Questions

A

1. What mathematical problems did Hardy tackle?
2. What did Hardy think about mathematics?
3. What example of a social function of mathematics does Haldane give?
4. What comparison did Hardy draw between mathematicians and coalminers?
5. Why do some scientists consider Hardy's theory of mathematics one-sided?
6. Why does the author compare the emotions caused by the writings of Hardy with classical music?

B

Give some examples of pure and applied scientific knowledge.