Teacher-mathematician

An obituary of V. V. Narlikar

Vishnu Vasudev Narlikar, who died on 1 April this year, was born at Kolhapur on 26 September 1908. He had his school education at Kolhapur and college education at Elphinstone College and the Royal Institute of Science, Bombay. After passing the B Sc honours examination of Bombay University in 1928 with 96 per cent marks in mathematics, he went to Cambridge for higher studies. There, in 1930, he passed the mathematics tripos. His research career began with studying Liapounov's famous paper on rotating fluid bodies. For a written review of Liapounov's method and achievement, he was awarded the Isaac Newton studentship in October 1930.

Narlikar returned to India in 1932. In that year, when he was a young man of twenty four, the late Pandit Madan Mohan Malviya persuaded him to join Banaras Hindu University as head of the department of mathematics. Narlikar taught mathematics at BHU for 28 years till 1960. After a stint with the Rajasthan Public Service Commission (as its chairman) for six years, he became Lokmanya Tilak professor of mathematics at the University of Poona in 1966. After retirement in 1973 he lived with his elder son, the well-known cosmologist Prof. Jayant Narlikar.

For Narlikar teaching and research were complementary. He could best be described as a teacher-mathematician. A teacher-mathematician — more than a teacher and a mathematician — is one who uses teaching methods in mathematical research and research methods in mathematics teaching. At BHU, in addition to general relativity and Riemannian geometry, Narlikar taught several other topics: modern algebra, groups, characters and applications; wave mechanics; spinors and their applications; Hilbert's space and quantum mechanics; stellar structure; etc. His philosophy of teaching can best be judged from his writings and lectures. At one place he has stated, 'When I started teaching mathematics at Banaras, I was more self-critical and I found that there were so many gaps and voids in my understanding of the topic I taught.' Elsewhere he has pointed out the reasons for these gaps: 'Mathematics of the eighties is going to be different from that of the seventies just as the mathematics of the seventies was different from that of the sixties. The mathematics that I learnt as a student differed very much from the mathematics I was called upon to teach.' He therefore concluded, 'The first lesson that I learnt was: one cannot be a good teacher a successful teacher, without being always absorbed in the research topics concerned with his lectures.' His mathematics classes were always enjoyable and his popular talks on

mathematical topics were always well appreciated because of his research-oriented method of presenting a topic.

Narlikar was a pioneer relativist in India. After joining BHU he had several student collaborators working with him in relativity. Soon this evolved into an active research school at BHU and later at Poona. The main research areas cultivated by this school were: (i) exact solutions of Einstein's equations of general relativity, (ii) the solutions of the unified field equations of Einstein and of Schrodinger, (iii) equations of motion as derived from field equations, (iv) the fourteen scalar differential invariants of the Riemannian metric and their physical significance, and (v) the geometrical and physical properties of metrics satisfying Einstein's field equations. About 20 young men were associated with him in research in these areas during 1932 to 1973. Most of them got doctorates, but what is more important, many of them continued their research and formed their own research groups. Thus a small seedling planted by Narlikar at BHU in the early thirties (and by Prof. N. R. Sen at Calcutta in the late twenties) has now flowered into a big banyan tree.

I mentioned earlier that Narlikar used teaching methods in mathematical research. To illustrate this I shall recount my personal experience as his research student in 1942–43. Incidentally this will bring into focus another trait of this teacher-mathematician — his transparent academic integrity. Narlikar suggested that I should work on the problem of the gravitational field of a radiating star. We began working on the problem together. We enunciated the problem in the following manner: to calculate the gravitational field of flowing energy by comparing the radiation flowing out of a star with the flow of a fluid. For such a comparison, the current belief was that, if the fluid were to represent radiation, its density should be three times the pressure. We started our work on the basis of this understanding but found it difficult to derive any tangible conclusion. Once, during discussion, I suggested that, instead of assuming the pressure–density relation, we might work on the basis of velocity: if the fluid is to represent the flow of radiation the fluid velocity must be assumed to be the velocity of the radiation, i.e. the velocity of light. Professor readily agreed and said, 'Yes, that is what we should have done!' We recast our calculations to suit the new assumption and at that very sitting Narlikar derived the first tangible equation. This sitting ended on a happy note and with the hope that I would be able to derive the other two equations.

In describing teaching methods, Narlikar had once said, 'It is necessary to

intersperse a lecture with periods of silence to allow the students time to ponder.' He used this teaching method in my case. Left with the task of working out the remaining equations of our problem, it so happened that I could not see him for two weeks (normally I used to meet him twice every week)—thus providing me 'time to ponder'. Well, the net result was that not only did I derive the other two equations of the problem but solved the three equations simultaneously and came up with the complete solution of the problem. At that stage I was overjoyed because, within eight months of beginning research, I had with me a solution of an outstanding unsolved problem. It is only now that I realize how much of this was due to the teaching method of 'providing time to ponder' so effectively used by Professor Narlikar.

We wrote down the final solution in the form of a paper for publication. Narlikar put down only my name as the author of the paper. The usual practice is that the professor who suggests the problem becomes the first author of the paper and the student's name is included as a joint author. But Narlikar did not follow that routine because the main idea which provided a breakthrough in the work was provided by me and so he gave full credit to me. Today, when I think about it, I realize that Narlikar very well knew the importance of this solution, and even if he had just added his name as a joint author, the solution would have been known as 'Narlikar's solution'. At that point of time I was too young to understand such things. The solution known today as 'Vaidya metric' could easily have been credited to his name if he had so desired, and that would have been in accordance with prevailing norms. But Narlikar preferred to stick to purer academic norms and decided that when the principal idea leading to the solution came from Vaidya the credit of the work must go to him. What a fine example of academic integrity!

Narlikar was one of the founding fellows of the Indian Academy of Sciences. He was president of the Calcutta Mathematical Society (1958–60) and of the Indian Mathematical Society (1981). But above all, he was revered by the present generation of Indian relativists as Grandpa Narlikar.

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Edited and published by Prof. S. Ramaseshan, Current Science Association, Bangalore 560 080.
Typeset and printed at Book-Makers (I) Pvt. Ltd., Bangalore 560 009.