

# Prof. V.V. Narlikar ~~provides~~ time to ponder

*A Teacher Mathematician*

By Prof. P. C. Vaidya

*We have all heard about Dr. Jayant Narlikar. Let us not confuse the Professor mentioned with Dr. Jayant Narlikar. As a matter of fact, Professor V.V. Narlikar is the father of Dr. Jayant V. Narlikar.*

After a brilliant career at Cambridge, Prof. V. V. Narlikar worked as Professor of Mathematics for 28 years at Benaras Hindu University (1932-1960) and later at Poona University (1966-1973).

He has been a teacher of mathematics. He has carried out some important research work in Mathematical Theory of Relativity and so he is also a mathematician. But the compound word "teacher-mathematician" implies something more than a "teacher and a mathematician".

A teacher-mathematician is one who uses teaching methods in mathematical research and uses research methods in mathematics teachings.

I have the good fortune of knowing Prof. Narlikar as a teacher-mathematician. I would like to share with others my memories of the happy days I spent for about a year at Benaras learning ABC of mathematical research from this

going to be different from that of the 70's just as the mathematics of the 70's was different from that of the 60's. You see the mathematics that I had learnt was of little use to me when I went to Cambridge (in 1928). Then the mathematics after October 4, 1957, when Sputnik I went up, became a different mathematics altogether".

A conscientious teacher of such a rapidly-developing subject like mathematics will certainly find gaps and voids in his understanding. He must learn several topics by himself. That leads Prof. Narlikar to say further:

"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 one's lectures".

The last phrase is to be noted. A researcher is absorbed in the research topics of his own speciality. The above three successive quotations of Prof. Narlikar lead one to the conclusion that to be a good teacher one must be absorbed in research on topics of one's lecture!

Generally, one teaches undergraduate and/or post-graduate classes and also carries out research in one's speciality. Nor-

young age I carried the impression that Relativity throws out a big challenge for mathematical research.

The research-oriented method of presenting his topics to the audience had captured at least one young mind. At the M. Sc. stage, occasion arose for me to choose an area of mathematics in which to specialise, I opted for Relativity. Later in an hour of crisis when the Ahimsak Vyayan Sangh (not an institute of mathematics, but a Gandhian institute of constructive work) where I was working had to be closed down, in May 1942 I remembered the amagnetic effect of those research oriented semi-popular lectures of Prof. Narlikar. I wrote to him requesting him to take me as a research student. Pat came his reply by return of post and on 28th June 1942 I reached Benaras to learn ABC of mathematical research under him.

I shall quickly go over some details of the research work I carried out during the year 1942-43 at Benaras. The same details will also bring into focus another important trait of this teacher-scientist: His transparent academic integrity.

I had attended Prof. Narlikar's Bombay University lecture during my college-days. In these lectures he had mentioned two outstanding

sion I suggested that instead of assuming the pressure-density relation, why not 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!" And we started recasting our calculations to suit the new assumption and at that very sitting Prof. Narlikar derived the first tangible equation. The sitting ended with a happy note and with the hope that I would be able to derive the other two equations.

In describing teaching methods, Prof. Narlikar had once mentioned, "It is necessary to interperse lectures of a teacher by a period 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".

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 my joining research, I had with me a solution of an outstanding unsolved problem.

It is only now (1988) that I realise how much of this was due to the teaching method of "providing time to ponder" so effectively used by Prof. Narlikar.

### Academic integrity

We wrote down the final solution in the form of a paper for publication. Prof. Narlikar put down only my name as the author.

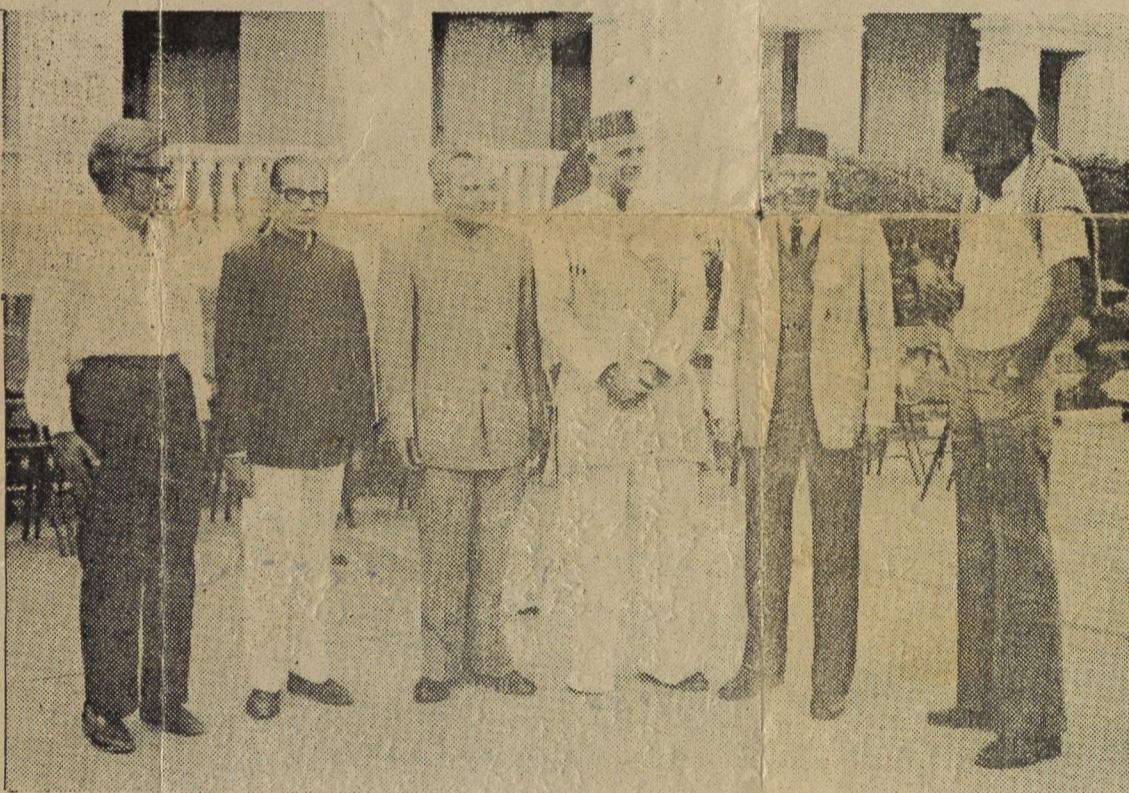
The usual practice is that the professor who has suggested the problem becomes the first author of the paper and the student's name is included as a joint author. But Prof. Narlikar did not follow that routine because the main idea which provided a break-through in this research was provided by me and so he gave the full credit of that research to me.

Today, when I think about it I realise that Prof. Narlikar very well knew the importance of this solution, and even if he had just added his name as a joint author, this solution would have been known as 'Narlikar's solution'.

At that time I was too young to understand such points. So the solution known today as 'Vaidya metric' could easily have been credited to his name if he had so desired. That would have been in accordance with prevailing norms. But he 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!

Prof. V. V. Narlikar completed 80 years of age last September and I thought this was an occasion to share with others my experiences of studying under him, of researching with him and ultimately of being a friend of this great teacher-mathematician — the Sandipani of the 20th century.

Prof. Vaidya is Professor-Emeritus of Mathematics and Vice-Chancellor of Gujarat University. He was chairman of Gujarat Public Service Commission and member of UPSC.



Pic. shows from right to left: Prof. Naresh Dadhich, Prof. V.V. Narlikar, the author Prof. P.C. Vaidya and to extreme left Prof. A.K. Raychaudhuri of Calcutta.

eminent teacher-mathematician.

I was a research student of Prof. Narlikar and again I was with him during the turbulent days of the Quit India Movement of 1942, when Benaras University was closed and almost "occupied" by the army.

### Research & lectures

I had no opportunity of learning mathematics in his class and therefore I have no first hand experience of Narlikar's way of using research methods while teaching a class. However, I have heard him on several occasions talking about teaching and learning of mathematics. I would therefore freely quote from memory his experiences as a mathematics teacher. He has said:

"When I started teaching mathematics at Benaras, I was more self-critical and I found that there were so many gaps and voids in my understanding of the topics I taught."

Elsewhere he points out the reasons for these gaps.

"The mathematics of the 90's is

mally one teaches several topics in class which may not be topics of one's research speciality. Prof. Narlikar believes that a good teacher must keep contact with research in those topics which one has to teach so that one conveys to the students no stale knowledge but the knowledge of a growing lively subject.

Prof. V. V. Narlikar's mathematics classes were always enjoyable and his popular talks (on mathematical topics) were always well-appreciated because of the research-oriented method of presenting a topic. Let me narrate a personal experience.

### Popular talks

In 1937 Prof. Narlikar was invited by Bombay University to deliver a course of lectures on General Theory of Relativity. I was a young undergraduate student and with some of my friends I attended those lectures. Not that I followed all that he talked about, but even at that

(hitherto — i.e. upto 1937) unsolved problems in Einstein's Theory of Relativity.

During my work at Benaras, when Prof. Narlikar thought I had reached a stage where I could try my hand at a research problem, he referred to these unsolved problems and suggested that I should pick up the first of the two problems and attempt to solve it. The problem was to work out the gravitational field of a radiating star in Einstein's Theory.

Both of us started working on this 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 this comparison-fluid the current belief was that if it is to represent radiation, the density should be three times the pressure.

### Time to ponder

We started our work on the basis of this current understanding, but we found it difficult to derive any tangible conclusion. Once during discus-

*very*  
*And by now was a teacher mathematician*

*Handwritten notes and signatures on the right margin.*

# Narlikar was India's pioneer Relativist

Prof. V. V. Narlikar, the pioneer Indian researcher on Einstein's Theory of Relativity, died on Monday. Here Arun Vaidya pays tribute to him.

**P**ROFESSOR VISHNU VASUDEV NARLIKAR, who died in Pune on April 1 at the age of 83 was a great teacher of mathematics, a pioneer Relativist in India, a popular orator on scientist topics and a warm personality.

Prof. Narlikar passed his B.Sc. examination in mathematics from Bombay University in 1928, obtaining



V. V. Narlikar

96 per cent marks, and went on to Cambridge for higher studies. He was awarded the prestigious Isaac Newton studentship for 1930, and for three years for 1931-34. Among his fellow students were H. J. Bhabha, S. Chandreshekhar and D. S. Kothari and his teachers included great mathematicians like Besicovitch, Cunningham, Eddington, and Dirac.

In 1932 he returned to India and taught mathematics at Banaras Hindu University till 1960. After a stint with the Rajasthan Public Service Commission, he became professor at the University of Poona in 1966. He retired in 1973, and spent the last 18 years in retirement with his son Jayant Narlikar.

During his years in Banaras and Poona he had at least three or four research students and quite a number of young lecturers in the university attending lectures on quantum mechanics, advanced statistics, advances algebra, groups and applications, tensor analysis, Riemannian geometry and topics like that.

Prof. Narlikar maintained that a teacher cannot be successful unless he approaches the area of his lecture from the point of view of a researcher, even if that is not the area of his specialisation. This approach made his lectures most interesting. He also believed in giving students time to ponder and digest. He adopted this technique even while supervising research of his Ph.D. students. He would discuss a research problem with a student and then would avoid meeting the student for a few days to give him time to ponder and arrive at his own solution.

Another remarkable trait of Prof. Narlikar's character was his academic integrity. Prof. P. C. Vaidya remembers the following episode. In 1941 Prof. Narlikar and he were discussing

the then-outstanding problem of working out the gravitational field of radiating star in Einstein's theory. The techniques used until then to solve the problem had proved inadequate. Young Vaidya suggested a new technique which turned out to be a major breakthrough and he was able to solve the problem.

A research paper was prepared on the solution. It was customary to include the name of the research guide as the principal author and the name of the student as a joint author in such a paper. But Prof. Narlikar put Vaidya's name as the sole author insisting that the main idea as well as all the detailed work had come from Vaidya and he must get full credit for the work. The paper became famous. What came to be known as Vaidya metric could have been called Narlikar metric if only he had so wished. And it would have been in accordance with the prevailing norms, but, Prof. Narlikar preferred purer academic norms.

No wonder his students adored him. They celebrated his 80th birthday by organising a symposium at the Tata Institute of Fundamental Research in Bombay. Among his students working in Gujarat are Professors P. C. Vaidya, J. Krishna Rao, A. R. Prasanna and R. S. Tikekar.

Prof. Narlikar was very fond of reading and would quote from a number of sources during his talks. His popular expositions of sources during his talks. His popular expositions of scientific topics were a treat to hear. He had also been president of the Indian Mathematical Society.

Prof. Narlikar's sons, Jayant and Anand, are scientists in their own right. Dr. Jayant Narlikar is a well-known astrophysicist, and science fiction writer in Marathi and is currently director of the Inter-University Centre for Astronomy and Astrophysics at Pune. Dr. Anand Narlikar is deputy director of National Physical Laboratories in Delhi.

## 6 Sanskrit pandits to be honoured

By A Staff Reporter

AHMEDABAD, April 4: The Governor, Dr. Sarup Singh, will present state awards to six Sanskrit pandits at a function to be held here on April 6.

The award winners for 1988-89 are Mr. Shantilal Jivram Joshi (Yajurveda), Mr. Kailashshankar L. Kashikar (Atharvaveda) and Mr. Ramdas Vishnu Kaundinya (Shastra) and that for 1989-90 are Mr. Narhari Bhaishankar Trivedi (Yajurveda), Mr. Natwarlal Gaurishankar Trivedi (Rigveda) and Mr. Jarnnashankar Pitambar Trivedi (Shastra).

Each award carries Rs. 10,000 in cash, a shawl and a certificate of merit.

# Wrangler V V Narlikar

**P**ROF. Narlikar, What had been the source of inspiration in your life as a teacher?

My main source of inspiration has been all along a quotation from the book *The imitation of Christ* which says "I teach without noise of words, without confusion of opinions, without ambition of honour, without the strife of arguments".

This quotation has often helped me in my dealings, particularly with students, as a philosophy of life wherein one would do what is expected of one without worrying too much about the awards. Another important aspect I always bore in mind was the dictum that "one cannot teach without learning" and thus I always tried to keep pace with new developments. In fact, this was also the advice given to me by Professor Larmor at Cambridge who often said, "A teacher must be always in a position to learn new things." In my opinion this is the basic understanding one needs to have for being a researcher as well as a teacher.

*What has been the main philosophy of your life?*

A person has to learn to distinguish between his 'needs' and 'wants'. I have always felt that Nature comes to your rescue where your 'needs' are concerned and your parents, relatives, friends fulfil your 'wants'. To put it in another way 'needs' are for your soul, the upliftment of which comes from trying to understand Nature while your

Choosing between ICS and Wranglership had been an easy task for Prof V V Narlikar. Talking to an old student of his, A.K. Prasanna, Narlikar recalls his Cambridge years.

physical well being is looked after by people around you. Talking of wants and needs I remembers what Sir Radhakrishnan when he wanted to select the subject for his course, one friend offered him freely a complete set of books on philosophy-thus fulfilling his wants so that he could take up his needs by pursuing the subject faithfully.

*During your stay in Banaras, apart from being a teacher -*

## PROFILE

*Mathematician you also had some administration to take care of?*

Yes, because of Acharya Narendra Dave was very particular, that I look after the general interest of other employees too apart from that of students. I was in charge of one fulfilling many appointments - one for the Vice Chancellor too - apart from deciding about freeships and scholarships, for deserving students. However, I am happy to say that I had all the time excellent relationships with Vice Chancellors. Of course, it was a privilege having had the patronage of people like

Pandit Madan Mohan Malaviya, Acharya Narendra Dave, and Sarvapally Radhakrishnan. *Sixty years ago, one knows it could not have been very easy to go to Cambridge. How did you achieve this?*

I remember those incidents very well. I come from Kolhapur, and after schooling there I came to Bombay's Elphinstone College. After my first examination, I overheard Mr Ckandarkar telling an elderly relative of mine that I had one extremely well in the courses and that I could become a Wrangler. These words got etched in my mind. There and then decided to fulfil this ambition and prof. Meldern, the then Principal of the College recommended my application to 'Tatas' for a travel fellowship. Mr Navroji Tata who was also impressed with my records agreed to sponsor me, though he tried to persuade me to take up ICS. But I was persistent in doing mathematics. On my arrival in Cambridge met Prof. F.C.Baker who first tested me by asking me to read through and summarise the work of Liaupnov on 'rotating Liquids'. This I did successfully after my Tripos and I got the scholarship to continue

in Cambridge and the Tyson medal. During the next few years I studied and worked with the three eminent scientists Professor Arthur Eddington on 'Neubulae' (Astronomy) with Professor Baker on 'rotating liquids' and with Prof. Larmor on 'Kelvin-Poincare Theorem'. The work I did earned me my



V.V. Narlikar

'Wranglership' as well as Smith's prize. *On completing your studies at Cambridge did you plan to return to India?*

As a matter of fact, Sir Arthur Eddington wanted me to go to the 'United States' to pursue my research in Astronomy and on several occasions he offered to arrange for my going to the States. But meanwhile Pandit Madan Mohan Malaviya the then Vice Chancellor of Banaras Hindu Uni-

versity while on a visit to Cambridge asked me to return to India and take up the professorship in BHU. This was in 1932 and I accepted this offer and returned home.

*How do you recollect the controversy that arose between Sir Eddington and Chandrasekhar?*

You see, Eddington firmly believed in the perfect gas hypothesis and could not go along with Chandrasekhar's ideas. However R.H.Fowler who had worked on the Physics of stars was in favour of Chan-

drasekhar. There is an amusing side to the story; when Eddington wrote the papers on Analysis of Stellar Structure, Chandrasekhar used to joke ASS number one, ASS number two etc, have come out. For this Eddington's reply came when on Chandrasekhar's papers "Internal Constitution of Stars" were published. This reply was ICS number one, ICS number two have come out.

*Prof. Prasanna is a noted relativist at the PRL, Ahmedabad.*

**A**FTER a brilliant career at Cambridge, Professor V.V. Narlikar, Prof Jayant Narlikar's father, worked as Professor of mathematics for 28 years at Banaras Hindu University (1932 - 1960) and later at Poona University (1966 - 1973). He has carried out some important research work in Mathematical Theory of Relativity and so he is also a mathematician. But the compound word Teacher-Mathematician mentioned in the title implies something more than merely a Teacher or a Mathematician. A teacher-mathematician is one who uses teaching methods in mathematical research and uses research methods in mathemati-

in the research topics of his own speciality. The above three successive quotations of Professor Narlikar lead one to the conclusion that to be a good teacher one must be absorbed in research on topics of his lecture! Generally when one teaches undergraduate and/or post-graduate classes he also carries out research in his speciality.

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## A teacher — mathematician

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So a conscientious teacher of such a rapidly developing subject like mathematics will certainly find gaps and voids in his understanding of the subject. He must learn several topics by himself and that leads Professor Narlikar to say that,

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In describing teaching methods, Professor Narlikar

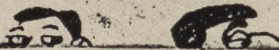
solution in the form of a paper for publication. And Professor Narlikar put down only my name as the author of that paper. The usual practice is professor who has suggested the problem becomes the first author that the paper and student's name is included as a joint author. But professor Narlikar did not follow that routine because the main idea which provided a breakthrough in this research was provided by me.

V.V. Narlikar is great Teacher-Mathematician - the Sandipani of 20th Century.

**P C Vaidya**

*Prof. Vaidya is a well-known relativist. His most important contribution is the "Vaidya Metric", which describes the gravational field around a radiating star.*

The growing of



Demerit of