

TRIBUTES TO A "FINE PHYSICIST"

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My first encounter with Varmaji was a formal one. That was in the month of July 1975 when I, as a fresh and a raw M. Sc. graduate, appeared for the interview at PRL to embark on a scientific career as a research student. Little did I know about him or his science. But, the person who, by his central position in the Interview Committee appeared to be its head, was dignified, friendly, kind and receptive. The interview, I had then felt, did go on very smoothly though, in retrospect, I know now that I had learnt more about Physics from him than I had presented as a prospective research student. Later in the day, when I was waiting at the PRL accounts section (in the front building) to collect my travel money, he personally came and suggested to me that I could think of joining PRL in a couple of days time. Within a few weeks of this incident, I had a reason to seek advice from Prof. N. Mukunda (of the Indian Institute of Science at Bangalore) regarding the offer from PRL. Prof. Mukunda not only recommended me to join PRL but also mentioned the name of a "fine physicist" working in the Theoretical Physics Area. The full meaning as well as the implications of those two simple-sounding words did not, of course, strike me immediately. However, very fortunately, I had, over the years, ample time and opportunities to understand as well as appreciate what those words really meant !

My association with Varmaji as a research student lasted for about five years. During this period, I had many occasions to see in him the working of an inspiring teacher, a 'fine' physicist and a very warm human being. In science, he has that uncanny ability to see through a maze of often clumsy and unwanted details, and then focus attention on the crux of the matter. I

still remember the excellent course he gave in PRL on “Thermodynamics and Statistical Mechanics”, which two subjects are, by and large, dismissed very quickly as ‘dull’ topics both by the students and the teachers at the university level. On the other hand, I had once a first-hand experience of his thought process run through to its logical conclusion by avoiding all the complicated in-between details. A common friend of ours had brought in, during tea time, the just arrived copy of Physical Review Letters and excitedly showed a paper on a new low-frequency instability in plasmas. Varmaji read the abstract, glanced through the paper and gave, within a few minutes, his verdict : The paper had to be wrong ! Of course, it was a matter of a few more months before the same journal carried comments by two different groups which explicitly showed by detailed analysis why the result was wrong.

As a working physicist, Varmaji had that remarkable interest as well as ability to look beyond the narrow specializations and spot those developments in Physics which were exciting as well as promising. By 1976, he had fully appreciated the far reaching implications of the seminal paper in Astrophysics (!) by Hénon and Heiles, and gave a couple of lectures to us (research students doing course work at that time) highlighting the important results of the paper. It is, of course, now a matter of history that the exciting field of Nonlinear Dynamics came to exist as an important branch of physics within a few years.

With each of his students, Varmaji always started work on a new topic which he saw as an opportunity to learn new things. When I joined him in early 1976 as a doctoral student, the topic of “Solitons” was gaining momentum as an important research activity not only in plasma physics but also in other fields. Though he had not worked earlier on this topic, Varmaji suggested I might start looking into this field. Soon he was not only up-to-date with the latest developments but also suggested couple of problems as possible topics for my thesis work. During this period, I had glimpses of his deep physical insights as well as excellent mathematical skills. While the former is essential to formulate a good problem, the latter is indispensable for cracking it. As he

likes to say, there should be some really exciting novelty in the basic idea over which a problem is formulated and in which one invests ones time and energy. And, my experience was that he was a real master in forging clean and good mathematical techniques. A major part of my thesis work was possible only because of a novel method he came up with to solve some equations we had encountered. I still remember vividly the excitement with which he showed, one fine morning, a few pages of his notes which contained the relevant details and which he had worked on the previous night. With that, the problem, as far as he was concerned, had been satisfactorily solved (but it was another matter that I spent the next six months working out the details).

In his own personal work, Varmaji has contributed significantly to different fields starting from Plasma Physics to Quantum Mechanics, and the papers in this volume bear testimony to this fact. Among the various scientific investigations that he pursued in his long innings, the one dearest to his heart has been the problem of the non-adiabatic motion of charged particles in magnetic mirror traps. This problem, in a sense, really 'belongs' to him: He not only defined and formulated it, but also gave an elegant solution which, to use his phrase, was the only "legitimate" one - a strong conviction indeed !! Being a true physicist, he then set out to experimentally verify his own predictions. Furthermore, with his characteristic insight, he later set out to investigate some fundamental problems in the field of Quantum Mechanics and its interpretations in the light of his experimental results. By his own admission, he has spent more than a quarter of a century over these problems but I still see him as enthusiastic and excited about them as ever. I have rarely seen such a conviction as well as enthusiasm over a problem by others.

On the personal side, he was during my student days more of a ever helping senior colleague than merely an officially supervising 'thesis advisor'. True to his philosophy of doing science, he gave me maximum freedom to develop my own ideas and convictions rather than impose his. Brevity of thought and expression was also a quality which he cherished most and practiced sincerely.

(During my early career, I had to revise a ten page manuscript seven times in seven days to meet his standards !) It is only fair to say that he was and, still is, very modest and unassuming in his own scientific achievements. In his early work on the magnetic mirrors, he had developed a model which neatly explained some of the experimental observations. The key input to the model depended on an idea which he proposed, in his characteristic style, based on purely physical grounds. The model itself was later rederived in all its fine details by others using sophisticated mathematical analysis. Almost a decade later, I happened to come across these papers which repeatedly made references to a model, to an equation and to a curve – all qualified by his name ! However, in my association with him all these years, I never heard him mention those papers even once.

I think Varmaji always believed that research should be done for its own sake and not because of external compulsions or requirements. Compulsions, if any, should come from within. He once told me that doing research was purely a personal matter and, therefore, any external interference was neither required nor welcome. Such a philosophy of doing scientific research is truly idealistic, and is fast becoming, very unfortunately, more and more difficult to practice, particularly in the present times. His scientific work and achievements over the last four decades seem, I think, to demonstrate that it can still be practiced provided one has strong and matching convictions.

Today, when I recall those two decades of my happy and fruitful association with Varmaji, I once again remember those two words : “fine physicist” – the latter, most appropriately, having no additional adjective (like theoretical, experimental, plasma, etc.) which only restricts its full and true meaning. Just those two words most correctly describe him. While paying my tributes to him on this occasion, I am fully aware that I was indeed fortunate to have met him in that formal interview in 1975.