

Editorial

N Mukunda, Chief Editor

The Oxford English Dictionary gives the meaning of the word 'polymath' as 'a person of much and varied learning, a great scholar'. If anyone in this century truly fits this description, surely it must be the theoretical physicist Erwin Schrödinger, best known for his 1926 discovery of the wave mechanical form of quantum mechanics. His wave equation – the Schrödinger equation – plays the same role here as Newton's equations of motion do in classical physics.

This issue of *Resonance* pays tribute to Schrödinger and his multifaceted genius. In an article-in-a-box, Virendra Singh provides a concise sketch of his life, personality and work; we have reviews of Walter Moore's shorter biography of Schrödinger, and of Schrödinger's own '*What is Life?*', a classic of popular science; and in 'Classics' we give you his Nobel Prize acceptance address from December 1933, titled '*The Fundamental Idea of Wave Mechanics*'. As a companion to the review of '*What is Life?*', we have one of another physicist's much later look at the problem of the origins of life, this time by Freeman Dyson.

Schrödinger's was a highly cultured and extremely refined personality, a product of Vienna at the height of empire. Ruth Braunizer, the eldest of his three daughters, reminisced about him on the occasion of a 1993 celebration of his lectures on 'What is Life?' fifty years earlier, and had this to say:

"The main influence was the milieu of Vienna between the turn of the century and the end of the 1920's ... There was a rapid growth of intellectual brilliance and talent in almost every field ... There was an excellent school system which stressed the humanities and being inexpensive it offered opportunities to all children, including those of moneyless parents".



"My father dreaded specialization and strove to be a generalist in every way. But this was the mark of his generation."

– Ruth Braunizer
on Erwin
Schrödinger

“... I consider natural science to be very much on the same line as the other trends of learning – or Wissenschaft, to use the German expression – cultivated at our universities and other centres for the advancement of knowledge ...”
–Erwin Schrödinger

“What, then, is in your opinion the value of natural science? I answer: Its scope, aim and value is the same as that of any other branch of human knowledge ... it is to obey the command of the Delphic deity ... ‘get to know yourself’”
–Erwin Schrödinger

Having been brought up in such a world:

“My father dreaded specialization and strove to be a generalist in every way. But this was the mark of his generation. Was it, though, beyond that, not also a very personal thing with him, something essential for his progress?”

As for his personality, she recalls:

“Contemplating all this, I must come to the conclusion that, whether his education and fine cultural grooming was relevant or not to his scientific achievement, they were certainly essential to his appearance and to the impression he made as a human being. He was a gentleman of the old time, which made him a very pleasant and lovable man to live with. He made one long for times gone by.”

From all this and what you will read elsewhere in this issue, you will be able to form a vivid picture of this great man. As for his unbelievable skills of exposition, there are countless examples – you must read them in the original.

The Nobel Prize address reprinted here is really a classic — accessible to every student and teacher today. About his true vocation, his daughter again says:

“... my father quite abruptly and emphatically said: ‘Before I ever knew what subject I should choose, I had made up my mind to become a teacher’. This sentence, although chiselled into my memory, is not a legend. It is rather a glimpse of the real Erwin Schrödinger. Not only was he, as I have learnt from many of his students, a very good teacher, having a beautifully clear and simple way of expressing himself, when speaking as well as writing ... but beyond that, the teaching profession meant something else in his life. He needed it to do what he did; it was truly instrumental.”

Schrödinger’s feeling for the universality, not just of science, but of all knowledge, was most deeply held. In ‘*Science and Humanism*’ he declared:



“... I consider natural science to be very much on the same line as the other trends of learning – or *Wissenschaft*, to use the German expression – cultivated at our universities and other centres for the advancement of knowledge ... You may ask – you are bound to ask me now: What, then, is in your opinion the value of natural science? I answer: Its scope, aim and value is the same as that of any other branch of human knowledge ... it is to obey the command of the Delphic deity ... ‘get to know yourself’ ”.

Let me hope this little issue of *Resonance* gives you a glimpse of this extraordinary personality.

Erwin Schrödinger – A Sketch

In 1926, Erwin Schrödinger (1887–1961) discovered wave mechanics and presented his celebrated Schrödinger equation. During that year, he published a set of four papers entitled ‘Quantisation as an Eigenvalue Problem’ in *Annalen der Physik*. The Schrödinger equation was contained in the first of these papers. It was also shown there that it leads to the correct energy spectrum for the hydrogen atom. In the next part, the energy eigenvalues were calculated for a simple harmonic oscillator and for a rotator. Another ‘derivation’ was also given by considering the mechanics-optics analogy. The perturbation theory for eigenvalues, with an application to the Stark Effect, was worked out in the third part, while the last part dealt with time dependent problems such as scattering, emission and absorption of radiation, etc. In these papers, wave mechanics was thus formulated in essentially the form we know it now. As Max Born said in 1961 “What is more magnificent in theoretical physics than his first six papers on wave mechanics?” And it was about the Schrödinger equation that Dirac had said in 1929 that it provides “the underlying physical laws necessary for the mathematical theory of a large part of physics and the whole of chemistry... ”

Schrödinger at the time of writing these papers had been a full Professor at Zürich since 1920. He was the third occupant of a chair in theoretical physics of which the previous occupants had been Einstein and von Laue. This might give the impression that he was already recognised as a great physicist at that time. It was not exactly so. He had published some thirty or so research papers spread out over the general theory of relativity, X-ray diffraction and statistical mechanics. Surprisingly, there are even four papers on colour theory and vision. The Zürich faculty was impressed rather by his versatility.

Schrödinger says in the preface to his *My View of the World* in 1960 “In 1918, when I was thirty-one,

