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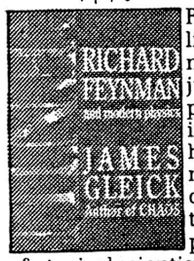
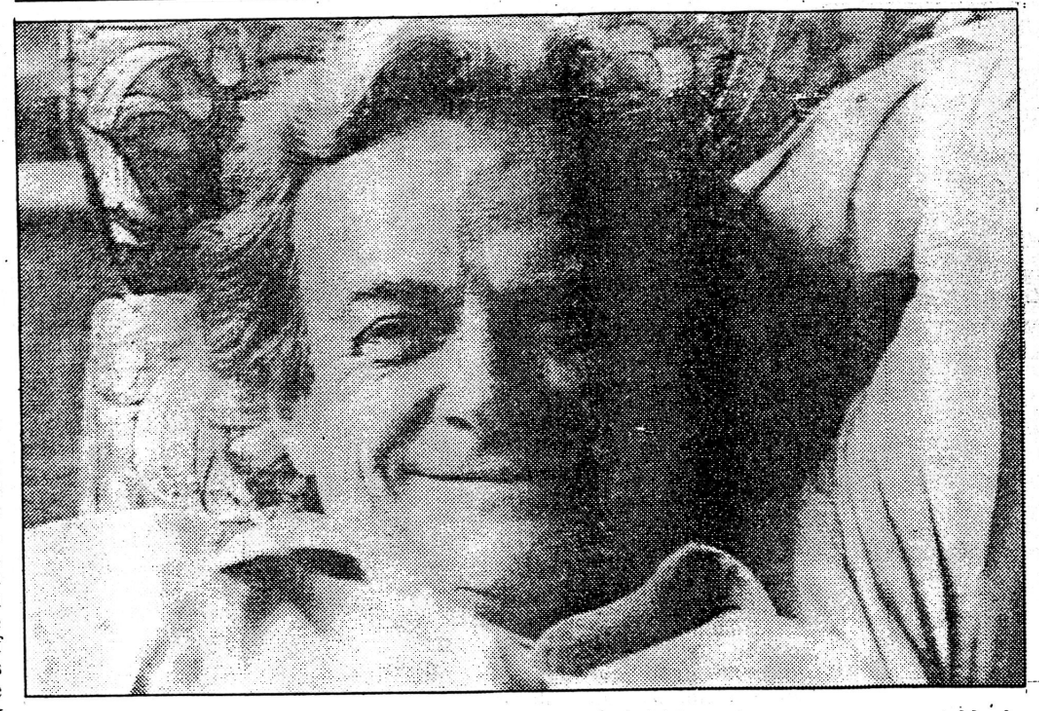
The practical life of a theorist

In his bestselling biography James Gleick traces the life and adventures of the physicist — Richard Feynman. Jayant Narlikar reviews





Richard Phillips Feynman was not just a Nobel prize winning physicist: he was a phenomenon, quite the antithesis of the public image of a typical scientist.

I first encountered Feynman at the Warsaw Conference on General Relativity, back in 1962 when I was a research student. The conference delegates were patiently waiting in a sightseeing bus while the driver was treating himself to a drink. Having waited ten minutes Feynman got out and started a harangue accompanied by wild gestures. The effect was immediate. The driver came rushing out and we were soon on our way. 'What were you saying? Do you know the Polish language?', people asked. 'Of course, not', replied Feynman. 'It is my own nonsense language which works: you see, the effect is due to the continuous outpouring of words and gestures!' This was characteristic of the man: he would improvise and use any method that delivered a solution to the problem at hand.

This book gives a graphic picture of the man behind the scientist and of the scientist behind so many major developments in particle physics. For, physics came a long way from 1918 —the year Feynman was born to 1987, the year he died. The book basically covers those seven decades. The chapters *Far Rockaway, MIT, Princeton, Los Alamos, Cornell* and *Caltech* describe in chronological order the different phases in Feynman's career. The Epilogue describes his final days. The last ninety-odd pages are devoted to source material, bibliography, etc.

This is not just a biography of a scientist. Nor is it written continuously as a life story. The narrative about Feynman is intertwined with what was happening in physics at the time, comments on other personalities, anecdotes, flashbacks etc. As such this is an unusual style for a biography, but it does succeed in doing justice to the man.

When Feynman was a student, quantum theory had passed through the early traumatic birth pangs and, thanks to the work of Schrodinger, Heisenberg and Dirac, settled down to a moderately well-shaped working theory. But there were problems. Quantum theory, special relativity and Maxwell's electromagnetic field theory could not be brought to co-exist. Even basic calculations of physical quantities threw up infinities instead of giving finite sensible answers.

By mid-1940s Dirac had already moved away from the mainstream of work on this front, finding in these infinities something fundamentally wrong. His generation was followed by a younger set, more optimistic, more persistent and, in Feynman's case more pragmatic. If the answers are infinite, could we find a technique of handling the infinities — a technique not respectable by rigorous mathematical standards but which nevertheless had its own self-consistent way of operation? Julian Schwinger, Richard Feynman and Shinichiro Tomonaga evolved such techniques independently — a piece of work important enough to fetch them a joint Nobel prize in 1965. Today the work is known as the renormalisation programme.

Before this work Feynman was recognized by his elders (like Oppenheimer) and colleagues as a brilliant young man with promise. That is how he was viewed at Los Alamos — a man who could do quick sums, find new ways of getting to the answer, and who would just as naturally play tricks and indulge in pranks. But — with his idolization of the recluse Paul Dirac, Feynman would have best appreciated Wigner's assessment of him: "He is a second Dirac, only this time human."

The book brings out the human side of Feynman and at the same time highlights the genius in him. His love for his first wife who died at a young age, his interaction with his mother and with his children and his role as a teacher.

I had attended his 1964 lectures at Caltech, that were subsequently published as the book *Quantum Mechanics and Path Integrals*. They were a superb example of histrionics, interspersed with dramatic monologues spicing a highly intuitive approach to a difficult subject. During these lectures, which everybody enjoyed immensely, he had to take time off to deliver a few invited talks elsewhere. He asked Murray Gellmann to substitute for him. Gellmann's formal and dry style was a marked contrast to Feynman's. When Feynman returned and asked the class about what Gellmann had taught, there were blank faces. "I see that you have not followed his lectures. Let me do it my way." He did — and everybody understood the topic.

Those were the days when Feynmann and Gellmann dominated particle physics. They were friends and colleagues but very different in their approach to physics. The book contrasts Gellmann from Feynman in a number of places and those who have come in contact with them both would appreciate the difference of styles, personalities, outlook... everything. Yet each in his own way has left his mark on post-war physics. The book also discusses other physicists, and passes value judgements on them with which not everyone who knows the subject would agree.

Like Dirac before him, Feynman also found himself staying away from the mainstream of particle physics in later times. The book captures his mood in this phase through an excerpt from an interview. A pragmatist by nature who sought close links between theory and experiment, he had this to say on the fashionable search for grand unification: "... There isn't any experimental check. ... Now, these guys are all trying to put all this together. They're trying to. But they haven't. Okay?"

If you are looking for 'when Feynman did what and where' you will find it hard to find ready answers in this book. They may be there but not in the form you want. Similarly the development of modern physics is neither chronological nor comprehensive. Both are anecdotal and their combination makes a refreshing account. A student of physics at graduate level will definitely enjoy both. The layman may find the accounts of modern physics a mixture of the readable and the incomprehensible. But he will still enjoy the book. Moreover, he would appreciate the serious and more profound side of the genius behind *Surely you're joking Mr Feynman.*

Genius: Richard Feynman and Modern Physics by James Gleick, Rupa & Co.; Rs 295