

on photons. Driving all this activity is the widespread success of, only matched by widespread dissatisfaction with, the standard model of particle physics. Everyone agrees that something new has to come up, be it relating to the Higg's particle already present in the existing model, or to the supersymmetric partners which are required by the most popular extensions of the present model. Perhaps the greatest gamble by *theoretical* physicists is adherence to and indeed energetic pursuit of a model whose main merit, as the wags put it, is that exactly half of the predicted particles have been discovered.

One needs to study the last two contributions to realize why this idea of supersymmetry is so compelling to theorists. Witten's overview is centred around the inner consistency and beauty of the ideas known collectively as string theory. One of the first lessons we learn is that strings—one dimensional objects in the place of the points of field theory—are just the motivation and the route to higher (and higher dimensional!) things. It is staggering to realize that old fashioned, i.e. pre-1995 string theory, regarded by many as too high in energy by 15 orders of magnitude to be of relevance to the highest energy accelerators, is regarded by the new breed of theorists as the low energy limit of the REAL theory. But let us remember that Einstein's theory of gravitation, which too started out as a quest for consistency and beauty, must have aroused similar feelings in its time, but is today an essential ingredient of something as mundane as global timekeeping! After this dizzying perspective, the book closes with F. Wilczek's more down to earth views on the future of particle physics as a natural science. There have been many accounts of this material—the successes of the standard model, its unnatural features, attempts to cure these and their possible tests, implications for cosmology, etc. This account is at a level and length which may be just right for a readership outside the particle physics community. An interesting underlying theme is the strong influence of the condensed matter theorists' experience with symmetries, phase transitions, collective excitations, effective theories incorporating what is relevant at a given scale, etc. Wilczek promises elaboration in a series of Reference Frame articles in *Physics Today* which has indeed now just begun.

The organizers of this meeting, and the authors of this book whom they invited, have taken on the increasingly difficult task of looking at all or at least much of physics as it stands today, with the courage to be selective and steer a course between superficiality and incomprehensibility. The fact that they have done their best still does not guarantee easy reading, but the book will have something for most physicists. It will have very many things for those cursed with curiosity but not blessed with infinite time, patience, and insight. Surely a good buy for any library which is used by serious students of contemporary physics.

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Darwin in 90 Minutes. John Gribbin and Mary Gribbin. Universities Press, 3-5-819 Hyderguda, Hyderabad 500 029, India. 1997. Price Rs 45.00. Pbk. 80 pp.

Mendel in 90 Minutes. John Gribbin and Mary Gribbin. Universities Press, 3-5-819 Hyderguda, Hyderabad 500 029, India. 1997. Price Rs 45.00 Pbk. 78 pp.MM

In this new innovative series of books, two of which are reviewed here, John and Mary Gribbin narrate the lives and accomplishments of a number of eminent scientists from both the physical and the biological sciences. All these books follow a similar format. They begin with a brief chapter that very succinctly describes the academic environment in which these scientists began their career, and the influence that the leading thinkers of that time may have had on their work. An introductory chapter of this kind is important since these books would appeal not only to non-scientists, but also to specialists who may not remember what came before as well as they remember what came after! This is followed by the main chapter which thoroughly examines the life and work of the chosen protagonist. What is most remarkable about this

section is the careful attention that the authors give to the smallest details of the scientists' personal lives. Knowledge of such details invariably provides insight into the motivations that must have contributed to their research as well. And all of this in about 60 pages of large easy-to-read script. Let me assure you this is no mean accomplishment.

An afterword, as short as the introduction, brings the account to a close. This section offers, in each case, a historical perspective of the academic aftermath that invariably followed such revolutionary thinking. A notable exception is that of Mendel, whose achievements in plant genetics were 'rediscovered' almost a quarter of a century after he finished his work. Finally, a table, common to all the books, provides a chronological 'history of science' from the construction of the famous observatory of Stonehenge in ca. 2000 BC to the tentative discovery of microscopic life in a Martian meteorite in 1996. Given the remarkable enthusiasm of the Gribbins, historians of our science, they obviously have a lot of work ahead of them!

To turn to the two texts in hand, there is much that I learnt about the two arguably greatest biologists of our times. Small details like how Darwin almost became a clergyman so that he could lead a comfortable life and how Mendel almost did not become one. How Mendel's actual fame as a meteorologist and astronomer may have prematurely terminated the recognition of the fundamental importance of his genetic experiments in his lifetime. How Darwin and Mendel came tantalizingly close to each other (different towns in England at the same time) but managed to never meet. How Darwin and Mendel did read of each other's work but how their implications for each other's theories completely escaped them both. It is amazing to rediscover how, like the phenomena of genetic recombination or evolution by natural selection, chance affects great scientific discoveries as profoundly as well.

The books also contain a wealth of personal detail. One thus learns of Darwin's realization that the person who would be most affected by his theory was his conventionally religious wife, Emma. Or, that Mendel was so wonderful and kind-hearted a teacher that he always passed his scores of students—his

argument being that it was better that he cultivate an enthusiasm for science in them rather than promote mechanical learning by rote. I was also struck by certain insightful observations that the authors make. A notable example of this is their evaluation that Mendel was ahead of his time not so much in his ideas but more in his absorption of the painstakingly accurate methods of experimental physics into botany. Enlightening ideas, entertaining books.

My only reservation about the biographies, however, is that they focus more on the lives of the scientists than their academic achievements. In all fairness to the authors, this may have been intentional. It would also not have been possible to maintain the easy accessibility of these books if they were to describe scientific work in any great detail. They should thus be considered more as easy

introductions into the lives and times of these great thinkers.

John and Mary Gribbin have contributed immensely to the popularization of science. In a scientific world that is becoming increasingly technical, jargon-filled and apparently out-of-reach, this scientist-teacher-writer couple has encouraged the interested lay majority not to be unfairly left behind. Their writings in pursuit of the marvellously contorted paths of scientific endeavour have encompassed a search for Schrödinger's cat and a journey down a DNA double helix; they have written about clouds, about comets, and provided glimpses into the life of Richard Feynman. Let me, therefore, express my admiration for their versatility and my appreciation of their work, an appreciation that deepens from the embarrassing recognition that many of us, so-called working scientists, have

never bothered to undertake a similar exercise—a debt that we also probably owe society.

A word of thanks also to the Universities Press who have provided us with this excellent series of biographies at very reasonable cost in an increasingly expensive world. I could also find only a single typographical error pointing to the painstaking effort that must have been put into the publications. It can only be hoped that our schools and colleges will avail of them and thus provide an inspiring glimpse to our students of how our lives came to be what they are today. I am sure the Gribbins would approve.

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