

What Galileo And Newton Started

Reviewed by **Richard N. Zare**

In Greek, the word is hubris; in Yiddish, it's chutzpah; however you say it, Brian L. Silver's "The Ascent of Science" has it.

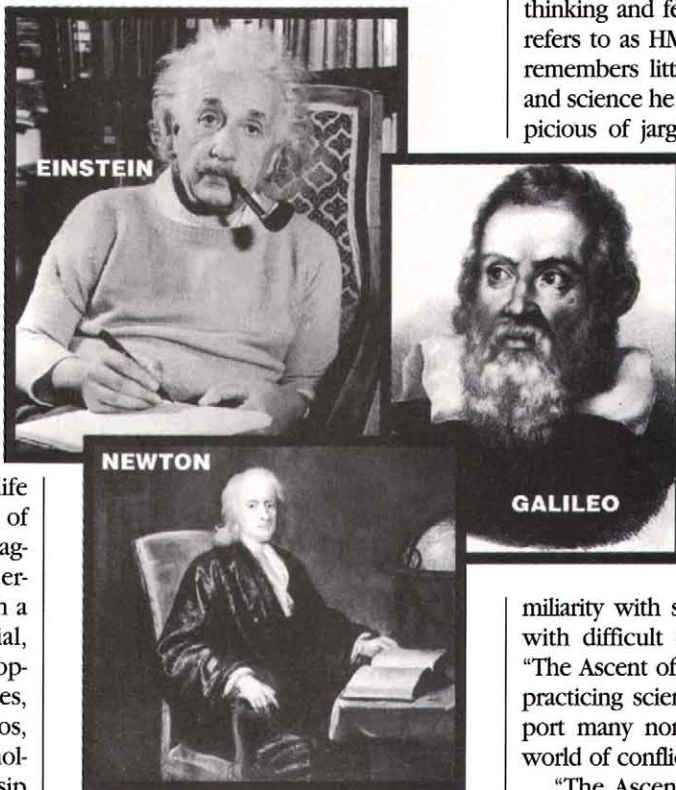
Imagine the nerve of someone presenting the full sweep of Western science from the Renaissance to the present in less than 550 pages! Silver traces the history of science, portrays the quirky characters who contributed to its rise, and describes the battlegrounds upon which intellectual wars have been waged—taking us from a deterministic clockwork universe to a chaotic, unpredictable one full of phenomena defying common-sense interpretations.

What is truly frightening and much to Silver's credit is that he succeeds most of the time, breathing life into what are often deadening stories of scientific advance. Silver has an engaging, witty style, filled with remarkable erudition. He skillfully guides us through a labyrinth of highly complex material, making inviting and comprehensible topics such as the kinetic theory of gases, the interference of wave motions, chaos, relativity, the gene machine, and cosmology. Along the way we learn such gossip as this: that one of Descartes' biographers claimed he was too wise to encumber himself with a wife but kept a "good-conditioned handsome woman . . . by whom he had some children" and that "Marie-Antoinette read pornographic books during long [church] services."

When I was a curious 10-year-old, I would sneak into the basement, open a locked cabinet, and read from my parents' collection of love letters and college-day diaries. Even though much of what I found was fairly incomprehensible to me, these writings made a great impression and gave me a glimpse of the future. This musty collection had never been fully organized, but I could browse it at will, always finding treasures amid trash.

"The Ascent of Science" invites similar browsing. Unfortunately, it, too, lacks the benefit of editorial oversight. Although it does not compel you to keep

reading, this book does handsomely reward careful study. Often I looked at topics I thought I knew fully only to find hidden gems and new insights. Indeed, I know of no similar book in the English



Lively, engaging look at 500 years of Western science portrays intellectual battlegrounds and the quirky characters who fought there

"The Ascent of Science," by Brian L. Silver, Oxford University Press, 198 Madison Ave., New York, N.Y., 10016, 1998, 534 pages, \$35 (ISBN 0-19-511699-2)

language, and I cannot help but be reminded of Bertrand Russell's "A History of Western Philosophy" in the ambitious expanse of material covered.

What makes an author dare to take on

such a project? Silver graduated with first-class honors in chemistry from University College, London, and later became a professor of physical chemistry at the Technion, Israel's institute of technology. He brings a sense of wonder and a joy for science to his writing. He is more interested in the ways in which science has deeply influenced our picture of the world than how its applications have benefited society.

Silver claims to have written this book for "l'homme moyenne sensuel," a typical thinking and feeling person, whom Silver refers to as HMS. Silver claims that "HMS remembers little or nothing of the math and science he learned at school, he is suspicious of jargon, he is more streetwise

than the average scientist, he is worried about the future of the planet, he may like a glass of single-malt whiskey to finish off the day. Above all, he is curious.

In about 50% of the cases he is in fact she." I don't think HMS is, in fact, the person Silver imagines. Instead, HMS needs to be a well-educated and thoughtful person having some familiarity with science, willing to struggle with difficult concepts. Thus, although "The Ascent of Science" may be fun for a practicing scientist, it is unlikely to transport many nonscientists into the arcane world of conflicting scientific ideas.

"The Ascent of Science" doesn't pretend to deliver an objective account. On the contrary, the author's opinions are always evident as he speaks to HMS. I disagree with some points, such as Silver's seeming inability to accept matter-wave duality as just the way nature is, even though I know Einstein was similarly troubled. Other points capture more nearly my own sentiments, such as these comments about elementary particles: "If we had discovered only protons, electrons, and neutrons (p,e,n), and never found one more particle, it would have made little difference to HMS. The p,e,n trio has underpinned our understanding of atomic and molecular structure and dynamics, and formed the basis of much of the technology and medical sciences that have changed our lives. . . . The rest of the exotic menagerie of particles have affected no one except those who write articles-on-particles."

Later Silver writes: "The likelihood

that the next particle that needs a multi-million dollar accelerator to produce (and then survives for only a quadrillionth of a second) is going to be widely useful is remote. Too remote, perhaps, to justify the enormous expenditure that could, at least in principle, be directed to a large variety of other no less interesting, and possibly more useful, scientific projects." Of course, it is far from obvious that funding resources can be redeployed simply on the basis of more scientific return.

Silver seems to sidestep entirely the issue of science embedded in society. Bluntly put, science can be found in many different societies, but it flourished in a particular way in the West. In the Islamic world, for example, knowledge of mathematics, astronomy, and medicine was more highly developed than in Europe until approximately the start of the 16th century. But science was not institutionalized in Islamic society as it has been in the West. Silver leaves unexplored what made it possible for science to become the force it has in Western civilization.

Silver likes to dwell on how Galileo and Descartes presented teachings that were offensive to church-states. But he may not give sufficient credit to the rise during the Middle Ages of theologian-natural philosophers with the explicit approval of the church and state, the importance of church-sponsored translations of Greco-Arabic science and natural philosophy into Latin, the organization of universities and learned societies, and the acceptance of the concept that observation and study of nature could be handmaidens to theology. These rich antecedents to Galileo and Newton are thoughtfully examined in Edward Grant's "The Foundations of Modern Science in the Middle Ages" (Cambridge University Press, 1996).

The ascent of science has not been so much in asking new questions but in finding new answers to time-honored questions that Aristotle, among others, posed. These new answers have increasingly included experimentation, which was an exceptional occurrence before the Middle Ages. The study of natural philosophy began a remarkable tradition of relatively free, rational inquiry—a tradition that made possible over centuries a continuous, uninterrupted series of scientific developments that has now spread around the world. These developments would not have occurred if the social orders in which they took place had not perceived direct benefit,

whether in commerce, defense, or fighting disease.

Often I play a game in which I imagine designing the perfect dinner party, where all the guests are scintillating companions. I certainly would invite Brian Silver to my dinner. Alas, such a soiree is not to be: Silver died suddenly just a few months before the publication of "The Ascent of

Science." I feel the loss, but this book serves as a fitting testament to one person's deep intellect and joyful pursuit of science.

Richard N. Zare, professor of natural science in the department of chemistry at Stanford University, completed a two-year term as chairman of the National Science Board in May 1998. ◀

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