

## Stories Behind Great Science

### Everything's Relative: And Other Fables From Science and Technology

Tony Rothman  
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(272 pp.). ISBN 0-471-20257-6

Reviewed by Robert March

Napoleon Bonaparte is said to have dismissed history as "a fraud agreed upon." Physicist and science writer Tony Rothman perhaps would prefer the less pejorative noun "fable," which is used in the title of his book *Everything's Relative: And Other Fables From Science and Technology*. But he does imply that Napoleon's maxim applies fully to the history of science, or at least to the way that history is



recounted in most science textbooks. Rothman's goal is not to debunk but rather to redistribute credit to those whom history has unjustly neglected. His book, for example, does not detract from Albert Einstein's deservedly towering reputation by acknowledging his debts to Jules Henri Poincaré and Hendrik Lorentz. Rothman is a fine writer who really knows how to spin a yarn, choosing each strand carefully to illustrate his point.

Some discoveries simply fall on fallow ground, as Rothman colorfully describes. Photographic pioneer Niepce de Saint-Victor had anticipated the discovery of radioactivity nearly 40 years before Henri Becquerel made the discovery in 1896 (a year after Wilhelm Röntgen's discovery of x rays made searches for new forms of invisible radiation respectable). Alexander Fleming's penicillin was discovered no less than six times over a 50-year period. And Gregor Mendel was not so much ignored for 34 years as misunderstood by his peers: When he re-

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ported his experiments on plant hybrids in 1865, the idea that one could explain observations in heredity in terms of a mathematical model based on unseen entities was simply not part of a biologist's bag of tricks.

Modesty may be a virtue, but as Russian physicist Yakov Zeldovich proclaimed, "Without publicity there is no prosperity." Rothman emphasizes that idea by providing examples of scientists not being fully credited for their work until well after the fact. The shy American physicist Joseph Henry, for example, was only fully recognized for his pioneering work on electromagnetism many years after his demise in 1878.

Some celebrated discoveries were by no means conclusive. J. J. Thomson's discovery that cathode rays have a charge-to-mass ratio 2000 times greater than that of a hydrogen ion did not unambiguously establish the existence of a particle 2000 times lighter than an atomic mass unit. However, his dogged insistence on that interpretation (and his status as head of the Cavendish Laboratory) carried the day for the electron. And the celebrated 1919 eclipse measurements that made Einstein a worldwide celebrity were far from definitive—that is, until Arthur Eddington presented them in the most dramatic fashion and then played the international press like a fine violin.

Perhaps the tale with the most tangled facts is that of the 1846 discovery of Neptune, based on calculations of the planet's perturbation on the orbit of Uranus. The discovery was, in fact, a fluke. French mathematician Urbain Le Verrier and his English counterpart John Couch Adams almost simultaneously deduced the same predicted orbit for Neptune and told astronomers where to look. But their calculated orbits were actually wrong; as luck would have it, Neptune's position at that time happened to correspond with their predicted orbits. Once the true orbit was figured out in 1846, it became clear that the calculations nearly coincided with the true orbit of Neptune only for that year. The story was further distorted by elements of nationalism in the subsequent fight over who officially found the planet first.

When he turns from science to technology, Rothman notes the com-

plications that arise from patent laws and the abundant litigation they often spawn. To attribute an invention to the person who ends up getting the patent can be a mistake. Technologically illiterate judges frequently decide who is awarded patents based on criteria that scientists would regard as bizarre.

Rothman offers some good fables in technology. Thomas Edison's incandescent light was by no means the first of its kind—but, for a while at least, it was the best. More to the point, Edison marketed it as part of a complete system for generating and distributing electricity. Guglielmo Marconi did not contribute a single original idea to the development of wireless telegraphy, and he harbored some serious misimpressions regarding the underlying science. Nonetheless, his commercial acumen—with a considerable element of ruthlessness—enabled him to dominate the scene.

*Everything's Relative* is a strong testimonial to the value of historians of science, and most of the fallacies that Rothman exposes were uncovered by their research. But too few scientists, and textbook authors, bother to read the science history. Rothman has written a page turner that will delight and enlighten scientists and laymen alike. Above all, the book conveys the message that science is not simply the product of a handful of geniuses but a collective effort that thrives despite—or perhaps because of—a lack of central direction. The truth often emerges only after every possible mistake has been made. All credit should not go to the solitary runner lucky enough to pass the torch across the finish line.

### Biological Physics: Energy, Information, Life

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These days, physics departments are going through agonizing introspection about whether to include biology in