A cowboy, a wunderkind and a computer whiz

Scientific Temperaments: Three Lives in Contemporary Science

P. J. Hilts

302 pp. Simon and Schuster, New York, 1983. $15.95

Reviewed by Robert March

Relations between science and journalism often founder on a clash of professional practices and values. One exacerbating factor is that a journalist seldom has enough space to do justice to the context of a scientific discovery.

In this book, Philip Hilts of the Washington *Post* escapes this limitation through the medium of three extended biographical essays. One is on physicist Robert Wilson. The other subjects are Mark Ptashne, a geneticist, and John McCarthy, a pioneer in artificial intelligence.

These are quick sketches—one might almost say caricatures. Each is flecked with anecdotes that convey the goals, methods and style of the discipline involved. With an eye for the telling detail, Hilts manages to portray what scientists actually *do* while on the job. Laboratory graffiti, gossip and the like give vivid color to the human aspects of research.

On the whole, Hilts deserves high marks for reportage. He has taken some pains to get his science straight, but his well-turned phrases occasionally harbor misleading implications, and his comments on the significance of a result sometimes border on hyperbole. History is another matter: For example, Hilts is mistaken to say that Leo Szilard's 1939 plea for self-censorship by fission researchers fell entirely on deaf ears.

When he looks at Fermilab's Bob Wilson, Hilts sees a *cowboy*—audacious, self-reliant, taciturn and ornery. Wilson himself might have chosen the image, and it is not far from the mark.

Hilts is accurate in his portrayal of Wilson's design philosophy (underdesign, fix what doesn't work) and his administrative style (delegate little, understaff, make people work until they drop). The near catastrophe and ultimate triumph of this approach are now legend, and they come to life by excerpts from the control-room logbook on one of the darker days. Fermilab was assuredly built on the blood, toil, tears and sweat of its staff.

Robert Wilson, one of three scientists Hilts describes in *Scientific Temperaments*.

Wilson, a sculptor as well as a physicist, viewed the lab as a vast work of art. This reviewer concurs in Hilts' judgment that, in the visual respect, it was an unqualified success. Visiting artists and art critics have praised the harmony of the lab's buildings and their surroundings and ambiance.

Mark Ptashne portrayed by Hilts, is a brash, ambitious, over-age *wunderkind*. Fame came early in his career, through the discovery of the long-sought "repressor" mechanism in bacteriophage lambda. Though now a Harvard department chairman and head of his own firm, he still clings to a studied *épater-les-bourgeois* nonconformity.

The story turns on Ptashne's multifarious roles in the 1970s. A veteran of the antiwar "new left," he was thrust into a futile effort to calm the fears of former allies seeking to ban his specialty, recombinant DNA research, in Cambridge. It is a cautionary tale of an era when many distrusted science as a menace to the Earth. A bit of caution could have benefitted the investors in the biotech "boom," who bid stocks in companies with no marketable products to dizzy heights, only to panic when it became clear that the quick payoffs they were seeing in Silicon Valley were not to be, in *this* industry.

John McCarthy coined the term "artificial intelligence" and may well rue the choice. It waves a red flag before those who fear that machines may render humans obsolete and discour-

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ages them from accepting that the successes point away from that eventuality.

McCarthy himself did much to realize the achievements of AI. His LISP compiler was the first built on the recognition that information, not arithmetic, would be the computer's main stock in trade. He is also the parent of multi-user interactive computing. All this was achieved in the late 1950s, when cumbersome and expensive vacuum-tube machines still ruled the roost.

I can only wish this book success. It represents a genre that may appeal to the broadest of audiences, and which shows great promise for revealing science as a creative human activity.

Vectorial Astrometry

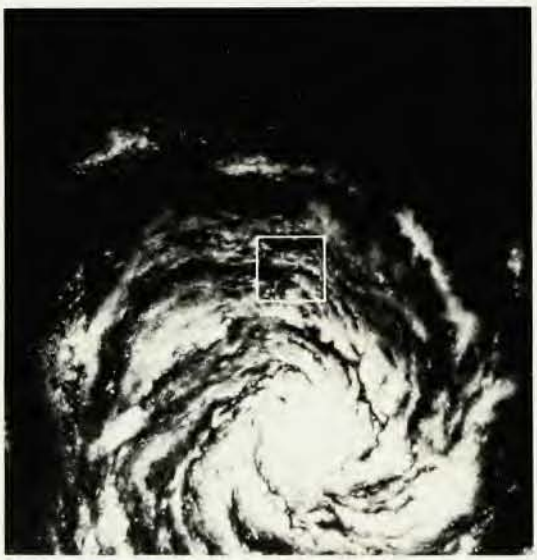
C. A. Murray
353 pp. Hilger (US dist. Heyden, Philadelphia), 1983. $49.00

This book is the most important work on astrometry since Simon Newcomb's *A Compendium of Spherical Astronomy* (1906). For the first time since the emergence of the New Astrometry about two decades ago, one of its most active and successful practitioners has written a book that gives it an authoritative theoretical treatment. Enlightened astronomers and astrophysicists have always known that there cannot be healthy astronomy or astrophysics without healthy astrometry. Murray's book shows that this is indeed so, and in addition, that astrometry is by no means a matter for those with little talent.

Astrometry is the oldest branch of the oldest science. Astronomers and other scientists often think that astrometry is old-fashioned, that there are no astrometric problems left unsolved and that imaginative and original scholars—especially during the period in which they must establish reputations to survive as professionals—will do better to devote their energies to subjects with more front-page appeal. Unfortunately, especially in the past, this undeserved reputation drew into astrometry some relatively unimaginative individuals who spent lives of drudgery gathering large masses of useful and necessary data. Their methods, sometimes naive even when they were new, did not do the field justice. Anyone (like this reviewer) who referees a fair number of papers on astrometry submitted for publication will regularly encounter authors with little background in the subject who are forced into astrometry and, reinventing the wheel, design it as an octagon.

The subject of astrometry is the definition and the empirical establishment of the kinematic parameters of celestial objects and the reference frames for these parameters. Since the natural mathematical tools—vectors and matrices—had not yet been invented a couple of centuries ago, the pioneer investigators (James Bradley, Friedrich Bessel) had to resort to the clumsy formalisms of spherical trigonometry when they did their work. Murray is the first author of a comprehensive treatise on astrometry who eschews not only the formulas of spherical trigonometry but also the fictitious "celestial sphere." These rejections are totally sensible in a work that deals with coordinates and their derivatives, even though the direct measurement of distances (that is, without involving directions) is at this time restricted to the objects of our solar system.

Informed investigators know that we are currently witnessing the development of new astrometric techniques, and that even the traditional methods are becoming ever more sophisticated. Most algorithms and theoretical formalisms that tradition has handed down are no longer adequate to accommodate the newly available precision and accuracy of astrometric measurements. This situation is, of course, not new.



Above (left) a depiction of our galaxy in a view 10^{21} meters across and (right) an enlargement of the area within the box, itself encompassing 10^{20} meters. The image on the right shows clouds of stars and gas, still much larger than individual stars. The pictures come from *Powers of Ten: A Book about the Relative Size of Things in the Universe and the Effect of Adding Another Zero* [Philip and Phylis Morrison, 150 pp. Scientific American (dist. Freeman, New York), 1983. $29.95]. The book is a transformation of the film *Powers of Ten* by the Office of Charles and Ray Eames, which itself was based on a children's book by Kees Boeke. The present book takes its readers on "a voyage of discovery through the universe" in 42 full-page illustrations, each one magnifying the last by a factor of 10. The journey starts at a super-galactic scale of 10^{25} meters and continues, through the scale in which we are most accustomed to seeing the world, down to the insides of a proton at 10^{-16} meters. In addition, the Morrisons "have organized a set of illustrated comments, lingering here and there, looking around, recalling the experience of earlier travelers, and seeking to convey the evidence that informed the carefully constructed images of the journey itself. The unity that arises so clearly out of the diverse sciences will, we hope, become perceptible and exciting . . . ."