BOOKS: HISTORY OF SCIENCE

The Great Success of a "Foul Book"

David L. Hull

Robert Chambers is known today for the anonymous publication of his *Vestiges of the Natural History of Creation* (1844), an extremely popular though amateurish theory of evolution that appeared fifteen years before Darwin's *Origin of Species*. If James Secord does nothing else in his new book *Victorian Sensation*, he provides a more knowledgeable and sensitive interpretation of this common conception. *Vestiges* combined a wide range of current scientific theories in an account of the world that ran from the formation of the solar system to the spiritual destiny of humanity. For a scientific publication of its day, *Vestiges* was enormously popular. At a time when publishers were lucky to sell 500 to 1000 copies of a new title, it sold over 7000 copies in two years, and the 14 editions released by the year 1900 totaled just under 40,000 copies. From 1859 till the end of the century, *Vestiges* consistently outsold the *Origin*. Secord's detailed examination of the causes and impact of this success provides a vivid cultural history of the popularization of science and evolutionary debates.

Victorian Sensation The Extraordinary Publication, Reception, and Secret Authorship of *Vestiges of the Natural History of Creation*

by James A. Secord

University of Chicago Press, Chicago, 2001. 644 pp. $35, £22.50. ISBN 0-226-74410-8.

One major topic of Secord's book is the nature, source, and ramifications of anonymous publication in Victorian Britain. At the time, anonymous publication did not imply what it does today, when anonymity is restricted primarily to referee reports. In Chambers's day, very few periodicals included the names of their contributors. Many novels were unsigned or issued under pseudonyms, and most book reviews were anonymous. Much of this secrecy was, however, pro forma. A popular parlor game of the era was deciding who penned which anonymous publications, and many authors intended their identities to be known. For example, Adam Sedgwick wrote an ill-tempered review (1847) of *Vestiges*, that "foul book" as he termed it, in such a way that his identity could be easily discerned. He did so in order for his scientific reputation to weigh against the book.

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As common as anonymous publication was in the early Victorian period, it was much rarer in works intended to be scientific. William Whewell's *Of the Plurality of Worlds* (1853), like *Vestiges*, was an exception, a scientific book published anonymously. In science, an author's credibility matters. That is why opponents of *Vestiges* went looking for respected scientists to review the book. Until Sedgwick, all declined because they did not want their names associated with such a scientifically disreputable publication. Whereas Sedgwick wrote in ways calculated to reveal his identity, Chambers was serious about retaining his anonymity, because he owned and ran a publishing firm that was susceptible to boycotts, especially by sacerdotal revilers. Even so, by 1847 the finger of guilt pointed increasingly at him. But he did not openly acknowledge authorship until the 12th edition of *Vestiges*, published posthumously in 1884.

Most students of science treat Chambers primarily as a precursor to Darwin. Secord thinks this emphasis is unfair. First and foremost, Chambers should be treated in his own right. Secord does mention Darwin, but not until the end of his book, where he discusses the influence of Chambers on Darwin not the anticipations of Darwin to be found in Chambers. Most scientists in Chambers's day thought of him as an amateur. A common complaint voiced by scientific critics of *Vestiges* was that it contained too many mistakes and tacitly accepted some extremely dubious theories, for example, the quinarian system of classification (which placed all organisms in nested sets of five) and phrenology (which postulated correlations between the shape of people's skulls and their basic mental abilities). In response, Chambers made numerous changes in subsequent editions of *Vestiges* and published a second book to counter such criticisms. He dropped his advocacy of quinarian classification and instead urged a genealogical classification, but he was unable to abandon phrenology. Chambers even went so far as to set about doing original research in an attempt to gain a reputation as a professional scientist.

Absorbed in a book. The subject in Robert Martineau's "The Last Chapter" (1863) is reading by the glow of the coal fire as a gray dawn breaks through the window.

CREDIT: BIRMINGHAM MUSEUMS & ART GALLERY

Was Chambers's book as scientific and substantial as Darwin's? As anachronistic as this question surely is, the only possible answer is "No." After all, Darwin worked on the species question for twenty years before publication, whereas Chambers spent less than three years writing *Vestiges*. Darwin developed his theory with the aid of a few, well-chosen colleagues, whereas Chambers acknowledged that he wrote his book "in solitude, and almost without the cognizance of a single human being." Although on some absolute scale Darwin's *Origin* was presented in a more scientific fashion than was Chambers's *Vestiges*, it should also be remembered that when Darwin's *Origin* appeared, it too was denounced as being insufficiently scientific by numerous critics (including Sedgwick).

Secord is interested in both Chambers and *Vestiges* in their own right, but he also has a larger goal. He intends to illustrate what it meant to "read a book" in Victorian England, and for him *Vestiges* functions as a "cultural tracer" toward this end. Secord believes his book "offers the most comprehensive analysis of the reading of any book other than the Bible ever undertaken." Anyone who reads *Victorian Sensation* from cover to cover is likely to agree. Secord discusses what it means for a book to cause a "sensation" and to be "popular." He documents the varied reception of *Vestiges* in three different Victorian cities—London, Liverpool, and Edinburgh.

He examines at great length the effect that the availability of cheap books, pamphlets, and newspapers had on the reception of *Vestiges*. Intelligent young men with little in the way of money or social connections availed themselves of Mutual Improvement Societies and circulating libraries. *Vestiges* was very popular among these ambitious young men and spurred them on to make contributions themselves. Two such men were Alfred Russel Wallace, the naturalist who almost scooped Darwin, and the mathematician Thomas Archer Hirst, who eventually became a member of the influential X-Club, an informal group of scientists who took it upon themselves to direct the course of British science in the 1860s and 1870s.

Secord does not limit himself to considering the printed word. He traces the re-

ception of *Vestiges* in more ephemeral venues such as exhibitions, diaries, and conversations at fashionable soirées. He also details the financial problems confronting anyone who anticipated a life in science. Science was not totally a province of gentleman of independent means, but making a living from one's work as a scientist was far from easy.

I have only one significant criticism of Secord's book: the author occasionally lets his own morals and social commitments show through. Although he carefully refrains from denigrating earlier scientists for not holding present-day scientific views, he is willing to castigate them for not holding present-day moral views. I thought, however, that judging the past from the perspective of one's own present-day views is the worst sin that any historian can commit. I, too, find the social life of the upper crust in Victorian England supercilious, and I can only shake my head when I read about all the barriers that women confronted at the time, but should I allow these present-day convictions inform my reading of the past? Presentism is as pernicious as it is difficult to avoid. This minor objection to one side, Secord documents the genesis and reception of one of the most popular books of the Victorian era in as great a sweep and depth as anyone could wish.

BOOKS: PHYSICS

Music of the Spheres

Matt Visser

Gravitational waves—oscillations in the very fabric of space and time—are one of the key effects predicted by Einstein's theory of gravity: general relativity. We currently have good indirect tests for the existence of such waves, but to date none have unambiguously been directly observed (although there are numerous other direct tests of Einstein's general relativity). In her book *Einstein's Unfinished Symphony*, science journalist Marcia Bartusiak describes the present status of interferometry-based experiments designed to detect gravitational waves and examines the prospects for using the soon-to-be-functional detectors as observatories for exotic astrophysical events.

First, a matter of language: The relativity community now typically speaks of "gravity waves" rather than the more proper "gravitational waves." This is much to the annoyance of the fluid dynamics community, for whom the term "gravity wave" is reserved for any wave in which buoyancy acts as a restoring force. (Since Archimedes's cry of "Eureka!" scientists have realized that buoyancy was related to gravity.) In Einstein's gravity, a "gravity wave" is an oscillation of the gravitational field itself; because gravity is the curvature of space-time, a general-relativity gravity wave is an oscillation, a periodic squeezing and stretching, of both space and time.

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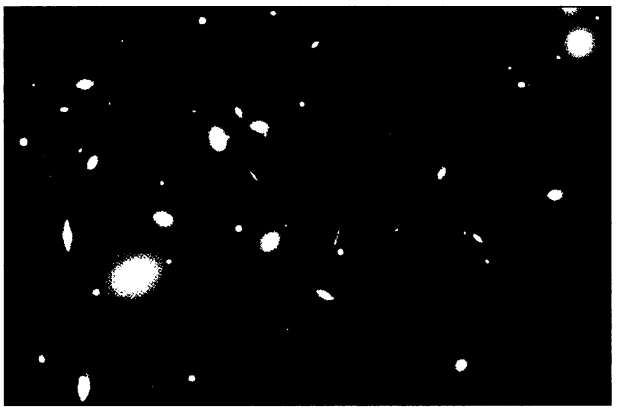

Heavy lens. The galaxy cluster Abell 2218 amplifies and bends light from more distant galaxies into concentric arcs, as predicted by general relativity.

Although there is no real doubt that gravity waves are out there waiting to be discovered, it is also clear that direct detection will be very difficult. (There is also always a small knee-jerk anti-Einstein fringe out there, but let's quietly ignore them.) The current generation of gravity wave detectors is relatively expensive, with the U.S. detector, the Laser Interferometry Gravitational-Wave Observatory (LIGO) estimated to cost about $300 million. (Four other detectors of various sensitivities are coming online in Australia, Germany, Italy, and Japan, establishing a truly international network.) By the standards of the relativity community, $300 million is a lot of money but not by those of many other major research efforts (for example, in particle physics or biology). Nevertheless, when such quantities of money are at issue there is always some heated discussion. On the brighter side, the various interferomety-based detectors are close to completion and the prospects for direct gravity wave detection look extremely promising—with a tremendous amount of detailed slog-work still in progress.

As Bartisuak reports, the relativity community has also been at pains to point out that historically every time the astrophysicists and astronomers have developed a new type of detector there have been surprises—new and unexpected powerful signals coming to us from the deep cosmos. To date, astrophysics has only explored the electromagnetic and cosmic-ray spectra. Gravity waves will add a whole new spectrum of opportunity, not merely widening the window but providing a whole new perspective on the cosmos. Estimates of the signals anticipated in interferometry-based gravity wave detectors have been based on conservative physics, the systems and objects we already know are out there. The really exciting possibility is that we might find something completely unexpected. (Gravity wave quasars, anyone?)

The field of gravity wave detection is not free from controversy, and Bartusiak provides a sympathetic and careful discussion of the late Joseph Weber's claims to have detected gravity waves with his resonant bar antennas as early as the 1970s. The current consensus is that Weber's bar detectors were picking up noise, not signal, and that his filtering algorithm did not suppress the noise as much as he thought it did. This issue of signal-to-noise is the paramount problem that needs to be addressed with the current interferometry-based generation of detectors, and it is where the greatest theoretical and experimetal challenges to gravity wave detection still lie.

Einstein's Unfinished Symphony Listening to the Sounds of Space-Time
by Marcia Bartusiak
Joseph Henry, Washington, DC, 2000. 263 pp. $24.95. ISBN 0-309-06987-4.

Why is the whole subject referred to as an "unfinished symphony"? Consider the gravity wave sources that we know are out there (for example, tight-orbit coalescing-binary neutron star systems) and calculate the frequency of the expected signal. If we then convert the gravity wave to acoustic energy, the interesting parts of the signal would be in the audible range. Although this would not be the way the actual search is carried out, one can envision a graduate student hooking up the output of the gravity wave detector to the input of a loudspeaker and really "listening to the sounds of space-time".

All in all, *Einstein's Unfinished Symphony* provides a delightful and clearly written survey of the physics, the hopes, and the fears of the gravity wave community. You do not need to be an expert in general relativity to appreciate Bartusiak's account, which anyone with a basic grounding in science will benefit from, and enjoy, reading.

CREDIT: NASA, A. FRUCHTER AND THE ERO TEAM (STSCI, ST-ECF)