BOOKS: ASTRONOMY

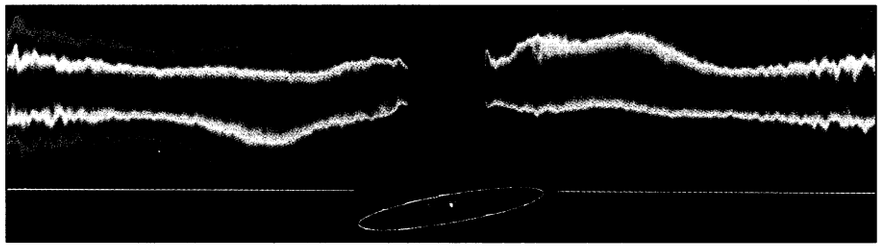
Seeking Planetary Systems

Jack J. Lissauer

One of the great scientific advances of the 1990s has been the discovery of planets in orbit about stars other than our sun. The first such planets to be discovered were found by Wolszczan and Frail (*1*) in 1992. These bodies have masses and orbits similar to those of terrestrial planets in our solar system, but they orbit a pulsar (a dense stellar remnant produced by a supernova explosion of a massive star). The first planet detected orbiting a normal (main sequence) star was discovered in 1995 by Mayor and Queloz (*2*), who found it through Doppler measurements of the reflex motion induced in the star 51 Pegasi by the planet's orbit. The companion to 51 Pegasi has a mass greater than that of Saturn, but orbits the star at a distance only one-twentieth that from Earth to the sun—again a surprising difference from our solar system. To date, all of the extrasolar planets discovered orbiting main sequence stars have been found through this Doppler technique, and most have been detected by Marcy and Butler's team (*3*). None appear to be less massive than 51 Pegasi's planet, and most either orbit very close to their stars or travel on much more eccentric paths than do any of the major planets in our solar system. Nonetheless, the observations do not preclude the possibility that the majority of planetary systems closely resemble our own. Because the sun's planets are all either low in mass or travel on distant orbits, they would be more difficult to discover by using the Doppler technique.

Looking for Earths
The Race to Find New Solar Systems
by Alan Boss
Wiley, New York, 1998. 252 pp. $27.95, C$39.50. ISBN 0-471-18421-7.

Looking for Earths: The Race to Find New Solar Systems presents a popular account of the colorful and checkered history of searches for extrasolar planets. Alan Boss tells this story from the perspective of a quasi-insider. He is not an observer directly involved in the search, but rather a theorist who has followed it with great interest and also influenced its direction by serving on NASA panels that have recommended which observational projects to support. He gives the reader a sense of the excitement and surprise as major discoveries were announced, and the disappointment as all of the early discoveries were retracted or disproven. Boss also provides an insightful look at the behind-the-scenes committee process, whereby major funding decisions affecting the direction of future research are made.



Pull of a planet. The warp in the disk of dust around the star Beta Pictoralis (viewed in visible-light with the Hubble Space Telescope Imaging Spectrograph) supports the presence of an unseen planet. (The central star is blocked, and the orbits of our solar system are added for scale.)

The book is not without its faults. The first is its title, which is quite misleading. Most of the book is not about "looking for Earths," as the large print on the front cover implies. It is, however, concerned with "the race to find new solar systems," words which appear on the cover in a much smaller font. I agree that focusing on giant planets is quite appropriate given the many recent discoveries, but a book's title should not attempt to fool prospective readers. Boss has not written a comprehensive review. Some of his terminology is quite unconventional. His presentation of the theory of planet formation is not balanced (*4*), and his interpretation of some observations differs from that of most observers and theorists in the field. For example, Boss believes that several Jupiter-mass objects on eccentric orbits about single stars formed by collapse (as did stars), and he refers to them as "brown dwarf stars." But these objects could well have been scattered onto their orbits by other planets (which may have been ejected to interstellar space by the encounter), and their discoverers have classified them as planets because of their low masses.

Astronomers looking for broader perspectives or for more technical details on planetary detection techniques will probably prefer two articles in this year's *Annual Reviews of Astronomy and Astrophysics* (*5*). Readers interested specifically in detection of planets similar to Earth should examine the Web sites of two proposed spacecraft missions that would have such capabilities (*6*). Nevertheless, *Looking for Earths* provides the general audience with a substantial amount of information about the search for extrasolar planets, as well as a good story.

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References and Notes

1. A. Wolszczan and D. A. Frail, *Nature* **355**, 145 (1992).
2. M. Mayor and D. Queloz, *ibid.* **378**, 355 (1995).
3. An overview of Marcy and Butler's planet detection program is available at www.physics.sfsu.edu/~gmarcy/planetsearch/planetsearch.html
4. Strong observational evidence now supports the classical nebula theory, which states that planets form within disks orbiting about young stars. Almost all specialists believe that terrestrial planets accumulate from initially small solid bodies known as planetesimals. Most models for the formation of Jupiter-like planets begin with the accretion of a solid core from planetesimals, but Boss models the formation of giant planets from gravitational instabilities in the gaseous component of the circumstellar disk.
5. G. W. Marcy and R. P. Butler, *Annu. Rev. Astr. Astrophy.* **36**, 57 (1998); N. Woolf and J. R. Angel, *ibid.*, p. 507.
6. http://ast.star.rl.ac.uk:80/darwin/ and www.kepler.arc.nasa.gov/

BOOKS: VIROLOGY

Small Sources of Great Affliction

Robin A. Weiss

It is the vogue to include the word plague in the title of books on infections. There is William McNeill's classic *Plagues and Peoples* (1976), which reviews the demography of infections to show how infectious diseases have affected the course of human history; *Plague's Progress* by Arno Karlen (1995) provides a social history of man and disease; and Laurie Garrett's *The Coming Plague* (1995) looks to the future. Michael Oldstone's *Viruses, Plagues, and History* differs from these in being written by an eminent and active research scientist, who has taken the bacteriologist

Viruses, Plagues, and History
by Michael B. A. Oldstone
Oxford University Press, New York, 1998. 223 pp. $25, £18.95. ISBN 0-19-511723-9.

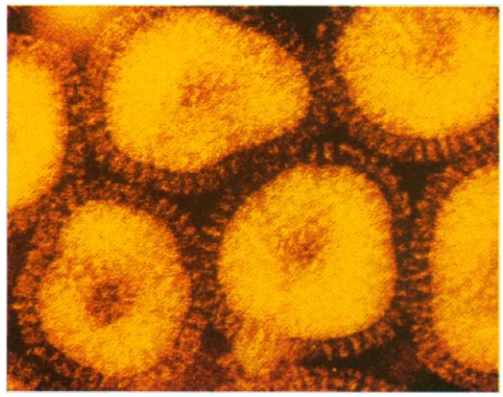
CREDIT: SALLY HEMP/NASA-GODDARD SPACE FLIGHT CENTER

Hans Zinsser's *Rats, Lice, and History* (1934) as his model.

Oldstone provides concise, telling accounts of the most dreaded viral epidemic diseases and of the virologists who pioneered their identification, pathogenesis, and prevention through vaccination. He begins by relating the success stories: smallpox, yellow fever, measles, and polio. Then he takes up the present challenges. These include, of course, acquired immunodeficiency syndrome (AIDS) caused by the human immunodeficiency virus (HIV), and the newly emerging hemorrhagic fevers caused by hantavirus, Ebola virus, and Lassa fever virus. Oldstone also discusses the transmissible spongiform encephalopathies, which in the past were thought to be caused by so-called "slow viruses" but that may actually be a result of the infectious spread of protein conformational change. (These afflictions have been brought into sharp focus by the recent epidemic of mad cow disease and 29 cases, thus far, of the related new variant of human Creutzfeldt-Jakob disease in England.) Finally, he turns to the influenza viruses. These killed far more people in 1918–19 than did enemy fire in the trenches, and they may return with a vengeance—last year's avian flu in Hong Kong was a near escape.

Oldstone's accounts demonstrate the devastating impact viral diseases have had as they spread through newly exposed human populations. Measles decimated natives in the New World and Polynesia. Smallpox served as the unwitting agent of Cortez and his Spanish conquistadors, and was deliberately spread among Native Americans by the British in their 1763 war with France over North America. Forty years later, the rampage of yellow fever in the Caribbean and Gulf of Mexico led Napoleon to negotiate the Louisiana Purchase with Thomas Jefferson. Yellow fever delayed for decades the building of the Panama Canal and plagued the Mississippi valley as late as 1878 (when Memphis was devastated and some 20,000 died throughout the region). Summer epidemics of poliomyelitis, such as the 1916 outbreak in New York City, created similar havoc; these continued with increasing severity into the early 1950s.

One of points that most impressed me while reading Oldstone's book is that governments and officials have repeatedly underestimated the impact of viral diseases and acted too slowly in attempting to control them. The stories of yellow fever in the 19th century and influenza early in the 20th century are reminiscent of the attitudes to AIDS and to bovine spongiform encephalopathy in our own times—complacency followed by panic. But there were also great successes. Encouraged by Franklin Delano Roosevelt (polio's most famous victim), the March of Dimes provided funding for the National Foundation for Infantile Paralysis, which crusaded against the polio virus. Donald Henderson, the hero of smallpox eradication, fought lethargy and disbelief for several years before he finally secured the World Health Organization funding necessary to snuff out this deadly virus in 1977.



Still a threat. Photomicrograph of influenza viruses.

CREDIT: K. G. MURTI/VISUALS UNLIMITED

Pioneering virologists often work at considerable risks to themselves, as is evident in Joe McCormick and Sue Fisher-Hoch's tale of the searches for the Lassa and Ebola viruses, *Level 4: Virus Hunters of the CDC* (1996). Oldstone shows that it was always so. In 1900, members of Walter Reed's Yellow Fever Commission decided to test the Cuban physician Carlos Finlay's hypothesis that the disease is spread by mosquitoes. Because only humans were then known to be susceptible to yellow fever, two of the members exposed themselves to insects that had previously fed on fever patients. John Carroll suffered high fever and jaundice but survived, whereas Jesse Lazear died 12 days later. This led William Gorgas to introduce anti-mosquito measures that decreased yellow fever in Havana from 1400 cases in the year 1900 to zero in 1902. The *Washington Post* of 2 November 1900 was less impressed by Lazear's death: "Of all the nonsensical rigmarole of yellow fever that has yet found its way into print, the silliest beyond compare is to be found in the arguments and theories generated by a mosquito hypothesis." This is a strange conclusion, because mosquito transmission had already been demonstrated for the parasitic diseases filariasis (by Patrick Manson, 1878) and malaria (by Ronald Ross, 1896). One is reminded of the London *Sunday Times* preaching, in the late 1980s and early 1990s, that HIV did not cause AIDS and that AIDS in Africa was a myth.

The histories Oldstone provides are not limited to topics of demography and public health. They also illuminate issues from virology, such as why it took so long to identify certain viruses and how much was gained through the use of cell cultures for isolation and for the development of vaccines. *Viruses, Plagues, and History* is accessible reading for the nonspecialist, and reminds virologists of our debt to the field's founders.

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BROWSINGS

Melanism. Evolution in Action. *Michael E. N. Majerus.* Oxford University Press, Oxford, 1998. 352 pp. $105, £115. ISBN 0-19-854983-0; Paper, $45, £23.95. ISBN 0-19-854982-2.

Majerus provides an excellent introduction to the nature, distribution, and cause of melanism (the increase of dark pigments in organisms). His reexamination of "industrial melanism" in the peppered moth, ***Biston betularia***, shows that this classic example of natural selection (first for, and later against, darker moths) is far more complex than the story of pollution and predation told in textbooks.

Visceral Perception. Understanding Internal Cognition. *György Ádám.* Plenum, New York, 1998. 252 pp. $49.50, £49. ISBN 0-306-45755-5.

This book is based on the author's lifelong consideration of how individuals perceive information from their alimentary tract, cardiovascular system, and kidneys, and how these signals affect emotional states. Ádám discusses links between these phenomena and cognitive functioning, as well as such issues as the placebo problem and visceral illusions.

We Were Burning. Japanese Entrepreneurs and the Forging of the Electronic Age. *Bob Johnstone.* Basic Books, New York, 1998. 448 pp. $27.50, £49. ISBN 0-465-09117-2.

Johnstone follows technologies such as the transitor and the microchip as they moved from their origin in the labs of the United States to their global presence in consumer electronics. He argues that Japan's successes stemmed from individualistic entrepreneurs rather than government-directed collective efforts.