could have been done with the information available to 1976. The storms are still too complex for us. The data, though they are sometimes spotty, are too plentiful to be fully assimilated, and the instrumental constraints are too severe. It would be foolhardy to say that these difficulties will soon be overcome (that's what some believed in the '50's), and yet it may not be too much to hope that the means of measuring all the parameters have become available, in no small part thanks to this experiment. Then, the tough imagination may emerge to go after the important data and with them to construct a quantitative taxonomy and mechanism of the major storm types.

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Geophysical Fluid Dynamics

Atmosphere-Ocean Dynamics. ADRIAN E. GILL. Academic Press, New York, 1982. xviii, 664 pp., illus. Cloth, $60; paper, $30. International Geophysics Series, vol. 30.

The economic and social impacts of the floods, droughts, and severe winters of the past decade have generated unprecedented demands for the development of useful weather and climate forecasts on monthly and seasonal time scales. Unfortunately, rapid mixing by transient weather systems appears to cause the atmosphere to lose all memory of its initial state after only a few weeks, suggesting that prospects for seasonal forecasting may be bleak.

Recently, however, meteorologists and oceanographers have found evidence suggesting that a small portion of the observed interannual climate variability in the Northern Hemisphere is associated with surface temperature anomalies in the equatorial Pacific, which are themselves excited by atmospheric motions. Apparently the oceans, with their huge thermal inertia, provide a means by which the climate system can retain some memory on seasonal and interannual time scales. Developing an understanding of the complex coupling between the atmosphere and oceans suggested by such observations will require the close collaboration of dynamic meteorologists and oceanographers. Such efforts appear to represent the only reasonable hope for climate forecasting.

Despite the scientific importance of treating the atmosphere and oceans as a coupled system, until recently no books presenting a unified treatment of atmosphere-ocean dynamics have been available. This is perhaps surprising since, contrary to superficial appearances, the dynamical processes governing the motions in the two fluids are virtually identical. The atmosphere and oceans are merely special cases of so-called "geophysical" fluids in which density stratification and rotation control the dominant motions.

The first attempt at a unified treatment of this subject was Joseph Pedlosky's *Geophysical Fluid Dynamics* (Springer-Verlag, 1979). Pedlosky's book provides an excellent systematic introduction to the theory of geophysical fluid dynamics, but with only minimal reference to observations. Gill's *Atmosphere-Ocean Dynamics*, by contrast, offers a wealth of information on observed phenomena in the atmosphere and the oceans, while still providing a carefully developed introduction to the fundamental dynamical theory, albeit with less rigor than Pedlosky's book.

The first several chapters of Gill's book cover the basic thermodynamics and fluid dynamics needed for analysis of atmospheric and oceanic motions. In subsequent chapters these concepts are further developed and applied to the study of forced motions, motions influenced by lateral boundaries, equatorial motions, midlatitude motions, and instabilities. Throughout the book Gill emphasizes the ubiquitous nature of waves in the atmosphere and oceans. Many novel linear wave solutions are presented to elucidate observed phenomena. Special emphasis is given to the equatorial regions, where, as indicated above, the large-scale interactions between the atmosphere and oceans may play a special role in climate variability.

The treatment is at a level suitable for introductory graduate courses in dynamic meteorology and dynamic oceanography. But the book will probably find its widest use as a reference work for professional meteorologists and oceanographers. The breadth of coverage, the strong emphasis on observational aspects, the comprehensive bibliography of recent literature, and the catalogue of data sources provided all make this book a treasure for the active researcher. The author's efforts to highlight critical historical developments in the subject are also to be applauded.

Atmosphere-Ocean Dynamics, with its clear focus on the application of dynamical principles to observed motion systems in the atmosphere and the oceans, should become the standard reference for oceanographers who wish to learn about the atmosphere and meteorologists who wish to learn about the oceans. The dynamics of these two geophysical fluids can no longer be treated in isolation. In providing a unified treatment, Gill has performed a vital service for the community.

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Social Medicine: Early Efforts

Death Is a Social Disease. Public Health and Political Economy in Early Industrial France. WILLIAM COLEMAN. University of Wisconsin Press, Madison, 1982. xxii, 324 pp., illus. $35. Wisconsin Publications in the History of Science and Medicine, no. 1.

"I have adopted throughout this work a subdued tone, one that is best suited, I believe, to portraying the central drama of this story, namely, the persistence of the discord between what one science, sociomedical investigation, presumed to teach and the action that another science, political economy, refused to countenance." In his introduction the author thus describes his approach and his organizing idea. His subject in the broadest sense is the relation between the empirical studies a society undertook of itself and its dominant values or ideology. At issue is research on health and human welfare undertaken in France during the years 1820 to 1850, years in which France experienced the first unsettling effects of the industrial revolution. Although Louis René Villermé, the leading sociomedical investigator in France in these decades, provides its focus, this book is not a biography; it is, rather, a case study of the emergence of the empirical study of the well-being of people in industrial society.

Coleman ably discusses both the nature of Villermé's research and the social and scientific notions he brought to it. The first third of the text considers the circumstances surrounding the work of this ardent investigator. Both the process and the economic and social consequences of early French industrialization are considered, as is the intellectual heritage of contemporaries who sought to investigate the human cost of such change. In the realm of ideas we are introduced to the skeptical and empirical tradition of Paris clinical medicine and to the legacy of French sensationalist psy-

chology that informed it. Of greater consequence for this study is the discussion of French political economy in the thought of J. B. Say and Simonde de Sismondi. Especially in the form cast by Say, political economy celebrated the reign of liberty—economic liberty, particularly—created by the Revolution and argued confidently that progress and human happiness were assured by the continued unrestricted exercise of that liberty. Here was philosophy that suited the new ruling order and was assumed by Villermé and many of his associates.

In the second third of the text the author turns to Villermé's publications. Though Coleman considers works on a diverse range of subjects, he emphasizes those on three research topics: the state of prisons (1820 and 1829), human mortality by social class (1826 to 1834), and the physical and moral condition of French textile workers (1840). These publications represent Villermé's most influential work and also illustrate the evolution of his approaches and opinions. Numerical data for studies such as he undertook were frequently scarce and almost always imperfect. Villermé showed both resourcefulness in finding and using what was available and, like most of the early social and medical statisticians, indifference to refinement in mathematical rigor. Both the investigator and his intended readers were practical men impatient for useful results.

These results were frequently striking. Morbidity and mortality data indicated that human well-being was determined by economic status. For example, Villermé found that the poorer and more miserable the condition of a prisoner prior to his captivity, the more likely he was to die during confinement. Likewise the mortality in the districts of Paris was inversely proportional to a crude measure of resident wealth. Similarly, cholera was more likely to claim a victim during the 1832 epidemic in the poorer than in the wealthier Parisian lodging houses.

Villermé was initially optimistic. His studies demonstrated that the causes of excessive mortality were man-made and remediable. In fact he was at pains to demonstrate that the high mortality in town districts was not due to geography or climate, conditions beyond human control, and that the premature deaths of industrial workers were not due to materials or conditions essential to factory employment. When human intervention occurred, as when reforms were made in prison management, mortality dropped. But as Villermé's attention moved from the special environment of the prison to the industrial city and then to the factory itself the issues became more troubling. The conflict between discovered fact and cherished ideology became acute.

That conflict is the special subject of this book's third and final section. Political economy promised that the defects of the new economic order would vanish with economic growth. But Villermé's inspections of textile districts had shown just how squalid and precarious was the life of industrial workers. Optimism was difficult in the face of his wage and cost-of-living data or his infant mortality rates. As an advocate of public hygiene, Villermé was dedicated to improving the health and lengthening the lives of the people. No mere propagandist, he flatly rejected Andrew Ure's fantastic defense of the early factory as a boon to those employed therein. But his analysis of the causes of misery took him into areas where his political and economic beliefs severely limited his options. Apart from state prohibition of child labor, justified on both humanitarian and economic grounds, Villermé could accept no public intervention to improve the circumstances of the laboring poor. He could recommend only voluntary, paternalistic efforts to employers and sobriety, industry, and patience to the workers. Political events in the 1840's made such solutions obsolete and Villermé increasingly bitter. In the aftermath of the revolution of 1848, in his middle 60's, he wrote a bitter, fearful attack on worker efforts to gain political and industrial power. This tract revealed the belief that contemporary class structure was rooted in inherent human differences and an expectation of deference and dependency from the lower orders.

Coleman's is an important book. The subject is well chosen to reveal the relations between empirical social research and its societal setting. The author handles both sides of this relationship competently. He gives a historical account that is well informed, balanced, and stimulating. With one or two small exceptions, such as the analogy drawn between the Parisian clinicians and their hygienist contemporaries, Coleman's analysis convinces.

Good work normally raises new questions, and such is the case here. One wonders why Villermé began so early to use the language of social class and why in his comparisons of human groups he so often favored economic differences, especially given that he could have foreseen that this sort of analysis might challenge the tenets of political economy. In Britain, where industrial life was also often miserable and laissez-faire the dominant economic creed, Villermé's younger contemporaries found the source of disease and early death in defects of the urban environment. Their analysis both explained their morbidity and mortality data and allowed remedial action (sanitary reform) that did not blatantly threaten those private economic interests that political economy protected. Having singled out economic causes, Villermé was left with unacceptable economic solutions. To put it crudely, was Villermeé more honest or more naïve than the English sanitarians? The differences in approach between the French and the English sociomedical investigators are important. Not the smallest merit of Coleman's book is that it offers the first significant analysis of that enterprise in France.

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Unorthodox Health Programs

Crusaders for Fitness. The History of American Health Reformers. JAMES C. WHARTON. Princeton University Press, Princeton, N.J., 1982. xii, 360 pp. + plates. $19.50.

The implicit assumption of *Crusaders for Fitness* is that the leaders of personal hygiene crusades, far from being a collection of foolish and naïve quacks, were often "well-educated and otherwise critical minds" who should not be dismissed, as a previous author has done, as "nuts among the berries." Wharton suggests further that radical schemes of hygiene appeared regularly on the American cultural landscape from 1830 to 1920 but tended to be especially prominent during periods of "general reformist ferment and social optimism when an expanding public spirit enlarged the constituency for perfectionist campaigns."

Wharton is particularly adept at demonstrating that one common thread that runs through the health schemes he deals with—from William Andrus Alcott's "Christian physiology" to Bernarr Macfadden's "Physcultopathy"—is the phenomenon Theodore Roszak (*Harper's Magazine*, Jan. 1981, p. 54) has termed "scientized mysticism," or the relaxed use of scientific ideas to satisfy what is essentially a religious yearning. Thus,