BOOK REVIEWS

Hydraulics Under Fire

Structures in the Stream. Water, Science, and the Rise of the U.S. Army Corps of Engineers. TODD SHALLAT. University of Texas Press, Austin, 1994. xii, 276 pp., illus. $34.95.

Not long ago, while explaining to a relative some contract work I was performing for the Office of History of the Army Corps of Engineers, I was surprised at the cool, almost hostile reaction that my mention of the Corps evoked. Apparently the Corps is not too popular in some parts of New Jersey. It is a reaction with which Todd Shallat is familiar. "I live in Idaho on a tributary of the Snake," he begins his preface, "where the U.S. Army Corps of Engineers is widely misunderstood and despised."

It is in large part to explain this hostility that Shallat, director of the public history program at Boise State University, has written his impressive, groundbreaking *Structures in the Stream*. Shallat uses federal water policy as the thread by which he examines the early history of the Army Corps of Engineers from its origins in the 18th century through the Mississippi Delta dispute of the late 19th century. The result is a succinct, analytical, and well-documented study that is, Shallat writes, "my way of thinking through the connection between science, technology, and political power."

Intriguingly, Shallat traces the origins of the controversy to a sharp cultural and technological division within the American engineering community. Heavily influenced from the start by the French tradition of engineering, American military engineers adhered to the French emphasis on centralized national planning, government financing, and military justification for internal improvement projects. They also adopted French engineering practices and technology, which emphasized the use of scientific methods and theory as the basis for application. American cadets studied French science and read French texts at West Point, and as commissioned officers they often traveled to France for additional study; so it is hardly surprising that they favored French ideas and methods in hydraulic engineering.

This Continental orientation put the Corps at odds with the mainstream of early American building culture, which, true to the British tradition of engineering, favored locally and privately financed projects that were justified on commercial grounds and carried out by self-taught gentleman-mechanics. Civilian American engineering practice, like that of the British, was based largely on empirical knowledge and rules of thumb and tended to follow British ideas and techniques. To civilian builders, and to much of the rest of American society, the Corps of Engineers seemed elitist, bureaucratic, and even threatening to American democratic institutions; while the Corps's technology seemed too theoretical, impractical, and unnecessarily expensive.

These cultural and technological conflicts played themselves out in political battles between the proponents and opponents of federal sponsorship of internal improvements throughout the 19th century. The Corps of Engineers was—and remains—far more involved in these early contests than has usually been recognized. One of Shallat's most cogent points is that however apolitical and neutral technicians may profess to be, they hold power by virtue of their expert knowledge, their control of information, and their role as implementers of government programs.

"Critics have long denounced the 'pork-barrel' ties that bind the Corps to the Senate and House." [From *Structures in the Stream*; courtesy of the *Arkansas Democratic Gazette* and George Fisher]

"Canal at Delta Point, 1862. Laboring in blistering heat, 1,200 slaves toiled alongside Union soldiers in an aborted attempt to bypass Confederate guns by cutting through a bend in the Mississippi River near Vicksburgh." [From *Structures in the Stream*; courtesy of the Boise Public Library]

"Ultimately, the power to quote statistics and package information shaped government as much as the shifting mandates of Congress and the ambiguous directives of law" (p. 156). The Corps promoted a grand vision of centralized planning and military-sponsored public works via the recommendations of individual officers and boards, such as the Board of Engineers for Internal Improvements in the 1820s. Disputes such as those over the Chesapeake & Ohio Canal and later the Mississippi River projects were as much about the Corps's philosophy and outlook as about its technology. The Army did succeed in establishing early its claim to jurisdiction over federal waterways projects, but the French tradition did not entirely prevail; public hostility to that tradition "helps explain why the United States remains one of the very few industrialized countries without a central planning authority or an intelligible national plan" (p. 6).

Given the partisan or polemical nature of much of the literature on the Corps of Engineers, *Structures in the Stream* is refreshingly balanced and objective. Shallat equivocates on the Corps's ultimate legacy. The Corps, he notes, is indeed authoritarian, hidebound, and often resistant to innovation, as its critics maintain; but it has also embraced innovation at other times, promoted the nation's commerce and safety, and advanced the concept of rational planning (for better or worse). "In the end," Shallat concludes, "there is no simple way to characterize Corps engineering. Cautious, responsive, despotic, opportunistic—

the engineers, after two hundred years, have learned to straddle the contradictions built into our nation state" (p. 207).

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Workings of HIV

HIV and the Pathogenesis of AIDS. JAY A. LEVY. ASM Press, Washington, DC, 1994. xiv, 359 pp., illus., + plates. Paper, $49; to American Society for Microbiology members, $39.

That human immunodeficiency virus causes AIDS has long been evident from its global and detailed epidemiology; for example, about 50 percent of HIV-infected hemophiliacs have developed AIDS thus far, whereas no HIV-negative hemophiliac has done so. Just how HIV causes AIDS has seemed more mystifying, although the salient clues have been there from the beginning. In 1981 Michael Gottlieb reported that AIDS patients exhibited a severe depletion of CD4-positive T-helper lymphocytes, and in 1984 David Klatzmann showed that these very cells are selectively sensitive to infection by HIV. Thus their depletion is explained by HIV infection, due either to the cytopathic effects of the virus itself or, more likely, to destruction by HIV-specific CD8-positive cytotoxic T lymphocytes. At first it seemed puzzling how few HIV-infected cells were detectable in peripheral blood at any one time. But by 1986 Klara Tenner-Racz had shown that the lymph nodes of asymptomatic HIV-positive people are actually chockablock with HIV, which is not a latent infection at all. In fact, the viral burden is high in many individuals. As George Shaw's and David Ho's groups recently reported, the turnover of HIV and HIV-infected cells is so rapid that it is a wonder how the immune system maintains its integrity for many years in the face of this viral onslaught. We may ask, therefore, why such an effective immune response is not successful in clearing the virus altogether? Yet if it cannot, why does it keep the more severe effects of HIV at bay so long, and what co-factors herald progression to AIDS? These questions about HIV pathogenesis are germane both to vaccine development and to therapeutic strategies to prevent or delay AIDS.

Jay Levy's monograph on HIV and the pathogenesis of AIDS tells you everything about HIV infection you might wish to find out without tackling the daunting literature on AIDS, which generates thousands of new research reports each year. It is a considerable achievement that one scholar could grasp the entire subject and distill our knowledge of it in 12 concise chapters and some 2000 references. Levy was a pioneer of HIV isolation and characterization, and he and his colleagues at the University of California at San Francisco have made signal contributions to the understanding of HIV in the brain, of HIV tropism, and of the role of CD8 cells in controlling infection. In this volume he has kept abreast of the ever-burgeoning field in a remarkably informed and balanced way. Indeed, I would have preferred him to be more opinionated about controversial aspects of HIV infection, as he can be in informal discussions, for that is a privilege of the single-author book amid so many multi-author volumes.

Levy moves from a description of HIV to features of transmission, the cell and molecular biology of infection, the enormous genetic and phenotype heterogeneity of HIV and its variable tropism for lymphocytes, macrophages, and dendritic cells, to the host's immune responses. He describes the pathogenesis of HIV not only in the immune system itself but also in the central nervous system, gastrointestinal tissue, and other organs. He does not dwell in detail on the various opportunistic infections that result from AIDS but includes a useful chapter on AIDS-related cancers. The final chapters deal with the prognosis for long-term survival featuring non-progressors and how antiviral approaches linked with immune modulation might form the pattern of future treatment.

The text is clearly illustrated with mainly black-and-white diagrams (and some colorful histopathology), useful boxed tables and lists, and appendixes on the clinical categories and classifications of AIDS. This volume will be valuable to the seasoned virologist, immunologist, or physician and to the newcomer to AIDS research alike.

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Patterns of Peopling

The History and Geography of Human Genes. L. LUCA CAVALLI-SFORZA, PAOLO MENOZZI, and ALBERTO PIAZZA. Princeton University Press, Princeton, NJ, 1994. xiv, 1032 pp., illus. $150 or £150.

In 1978 the authors of this volume, in a paper in this journal, helped reinvigorate interest in the analysis of geographic patterns of genetic variation as a method for inferring pattern and process in the evolution and history of human populations. The paper, and the cover of the issue of *Science* that contained it, became well known as having introduced the method of synthetic gene-frequency maps. The present volume is the culmination of a 20-year collaboration to document the extent and patterning of human genetic variation using classical markers. According to the authors, the "book was started with the desire to analyze the geography of human genes, using new techniques we have developed for the purpose of studying ancient human migrations."

Cavalli-Sforza and colleagues have compiled an unprecedented array of genetic data on the world's populations. The original database consisted of over 76,000 allele frequencies from 6633 separate samples. The authors exercised a mixture of culling and pooling strategies to reduce the database to a more analytically manageable 491 populations with observations on over 120 alleles. Although the criteria applied in this culling and pooling of samples are left frustratingly vague, the appendixes make clear which populations are used in the basic analyses presented throughout the book.

The largest section—the second half—of this compendium consists of more than 500 gene-frequency maps. For each allele for which sufficient observations are available there is a map reflecting the world distribution of its frequency, as well as separate maps displaying the allele frequency diversity on separate continents: Africa, Asia, Europe, America, and the Pacific Islands, including Australia and New Guinea. The maps include the geographic location of each population from which data are used, symbols intended to help the reader judge the fit between the original data and the map, and three small graphs, one summarizing the descriptive statistics of the distribution of the allele frequencies, one showing the sample sizes, and a variogram, a standardized method of indicating the relationship between geography and genetic variation. In addition to these single-gene maps, color maps reflecting the conjoint distribution of the first three principal-component scores of allele frequencies are also given for the world and the five continental areas.

The single-gene maps are an impressive summation of genetic data. Valuable as I believe they are, however, they should be viewed with considerable caution. The map of *HLAA*2* for the Americas is illustrative. The portion of the map of North America north of Mexico is based on only 10 data points: two in western Alaska, two on the Arctic coast of Canada, one in the U.S. southeast, and five clustered closely in the U.S. southwest. Additionally, Greenland is represented by a single observation on the