

Misguided Scientism

The Surgical Solution. A History of Involuntary Sterilization in the United States. PHILIP R. REILLY. Johns Hopkins University Press, Baltimore, MD, 1991. xviii, 190 pp. \$19.95.

Philip Reilly's *The Surgical Solution* should be required reading for legislators and biomedical policy-makers who are not familiar with the history of sterilization abuse in the United States. Although the story has been told before in histories of the eugenics movement, Reilly provides the best-documented and most detailed account of the involuntary sterilization of institutionalized persons and definitively demonstrates that "society has sometimes not hesitated to pursue what it perceived to be cost-saving measures at the expense of personal liberties." He urges us not to dismiss his chronicle of sterilizations performed in the name of eugenics or economy as " quaint tales of a bygone era" but insists that we must "remember that in the name of science not so long ago, sixty thousand American citizens were subjected to eugenic sterilization. We must forever guard against the kind of flawed thinking that supported this activity" (p. 165).

The flawed thinking of eugenicists has been extensively analyzed by historians. Benchmarks in the literature include Mark Haller's *Eugenics: Hereditarian Attitudes in American Thought* (1963), Daniel Kevles's *In the Name of Eugenics: Genetics and the Uses of Human Heredity* (1985), Raymond Fancher's *The Intelligence Men: Makers of the IQ Controversy* (1985), and Barry Mehler's doctoral dissertation on the eugenics network in the United States (Washington University, St. Louis, 1987). Although the eugenics movement enlisted a relatively small number of individuals, they included influentials in the rise of such learned professions as medicine and social work and key figures in the creation of the academic research establishment in the United States. Although eugenicists failed to gain firm political support for their programs of social control, they did shape the discussion of policy issues ranging from the sources of social dependency to the restriction of mass immigration to the sterilization of persons deemed mentally deficient. Their concerns and vocabulary persist in contemporary de-

bates over the relative importance of heredity and environment in human affairs and in our efforts to explain inequality among ethnic groups.

Reilly's contribution to the large, distinguished, and disturbing literature on eugenics is to emphasize the continuing influence of naive Mendelianism on those who were responsible for the care of the inmates of mental hospitals and prisons. Significant numbers of American physicians, legislators, and policy-makers embraced crude biological explanations for the plight of the mentally deficient or socially deviant long after it had been definitively demonstrated that hereditary defect could not explain the great majority of such cases and that no program of involuntary sterilization would have significant eugenic effect. In 1960, 97 persons were involuntarily sterilized in Virginia's public hospitals, and Reilly makes it clear that this fact should not be seen as an example of southern reactionism but as a representative example of national progressive reform gone sour. He makes a convincing case that we are capable of repeating the errors of the past, but a more optimistic interpretation of Reilly's history is possible.

By the 1980s both the courts and the United States Department of Health, Education and Welfare had issued stringent guidelines that clearly placed those who sought to coerce the dependent or deviant into sterilization outside the pale of established professional practice or prevailing ethical standards. The eugenics movement had proven to be an utter failure by its own standard, the improvement of the national gene pool through selective breeding. By the end of his narrative, Reilly seems to have run out of domestic examples of sterilization abuse and cites examples of coercive practices in India and China for our instruction. Though Reilly's prediction that "proposals to coerce people into submitting to sterilization will continue to arise" is well founded, current debates involve the "right to sterilization" and the limits of individual freedom to reproduce regardless of the social consequences. As Reilly cautiously observes, "The era of involuntary sterilization for eugenic reasons seems over" (p. 160). Unfortunately, our current standards cannot provide

consolation to the 60,000 victims of error and social prejudice on the part of 20th-century American professional leaders, whose misguided scientism rationalized evil practices.

JAMES REED

Department of History,
Rutgers University,
New Brunswick, NJ 08903

A Fish That Gets Away

Living Fossil. The Story of the Coelacanth. KEITH STEWART THOMSON. Norton, New York, 1991. 252 pp., illus. \$19.95.

The elder Pliny was prescient in stating, "There is always something new out of Africa." The capture of a living coelacanthid fish off South Africa in 1938 was the stuff of dreams. Presumed extinct for nearly 80 million years, the curious creature was named *Latimeria chalumnae* by J. L. B. Smith of South Africa and was variously heralded as a "missing link" and a "living fossil." It was hoped that this holdout from the Cretaceous would provide an opportunity to look back to the transition from fish to amphibians, for it was then held by many biologists that ancient coelacanths were the sister group to the tetrapods. Subsequent discoveries have not supported that hypothesis; however, the events and personalities of the last 53 years have provided one of the most fascinating biological dramas of the 20th century. Thomson has reported this, albeit incompletely and not without bias, in a volume that is of general interest to naturalists.

Thomson's vantage is that of a student of fossil fishes and the fortunate recipient of the first frozen *Latimeria* for proper study, which provided him and his colleagues an opportunity to make several extraordinary discoveries, beginning with Grace Pickford's finding that "it has the blood of a shark." Beyond the general biology of *Latimeria*, this volume contains the drama of the first and subsequent captures from the Comores; a discussion of the "living fossil" concept; an explanation of continental movements from Pangea to the present; an account of the early French researches; an analysis of coelacanth swimming aided by the extraordinary underwater photographs taken by Hans Frick; a brief discussion of coelacanth-tetrapod relationships; and a ponderous sermon about conservation.

What is not accomplished is an adequate treatment of the controversy concerning *Latimeria* relationships. Coelacanth phylogeny is still argued and debated. The hypothesis that *Latimeria* is the closest living relative to the tetrapods finds support in some paleon-

tologists' view that coelacanths and tetrapods both descended from Devonian rhipidistians. Yet similarities in the inner ear and spinal cord of *Latimeria* and fossil rhipidistians are explainable on grounds other than ancestry, namely convergence. Other theories suggest that lungfishes and coelacanths are the sister group to the tetrapods, supported by brain characteristics, or that *Latimeria* is the sister group to lungfish and tetrapods (assumed by Thomson), on the basis of evidence from certain soft anatomy and skeletal characters. The most provocative theory suggests that *Latimeria* is more closely related to sharks and other cartilaginous fishes, sharing with them similarities in the anatomy of the pituitary and pancreas and possession of a rectal gland, large eggs, and a mechanism of osmoregulation using urea and trimethylamine oxide. This is dismissed by many as the result of the retention of primitive vertebrate features; however, the complex shared pituitary condition is hard to explain away by convergence.

This work would have benefited from a more extensive bibliography (literature is cited only as notes to text) and a discussion of the recent discoveries made by the Japanese. Last, a more extensive discussion of the recent Comoran political and social milieu (including the coups by soldier of fortune Bob Denard, the recent presidential assassination, and the increasing population and poverty of the Comores) would help to explain the difficulties that coelacanth protection will encounter in such a poor fishing nation.

Latimeria and its kin, enigmas since the Cretaceous, remain such.

JOHN E. MCCOSKER
California Academy of Sciences,
San Francisco, CA 94118

The Biology of Aging

Longevity, Senescence, and the Genome.

CALEB E. FINCH. University of Chicago Press, Chicago, IL, 1991. xvi, 922 pp., illus. \$49.95. John D. and Catherine T. MacArthur Foundation Series on Mental Health and Development

It is not an easy task to review a book that spans survival analysis, endocrinology, biochemistry, paleobiology, morphogenesis, life history theory, molecular biology, neurobiology, and immunology and that introduces 600 or so animal and plant species along the way.

While trying to think about how to synthesize the book, I find myself instead thinking about the author. Here, too, a profusion of images arises. First there is Caleb Finch, professor in the neurobiology of aging and

doyen of an influential and productive research group on neuroendocrine and reproductive senescence. Then, pushing this image aside, comes that of an old-time prospector. Scientific discovery is a bit like digging for gold. The pioneering work gets done by individualists, frequently following lonesome trails, commonly a little eccentric, and often failing in their quests. Every now and then, an inspired or lucky strike turns up a vein rich and promising enough to draw a crowd. Gerontology has been slow to yield up its nuggets of gold, but in this remarkable book Finch has dug up a veritable treasury of information. That he has prospected far and wide is evidenced by the 163 pages of bibliography, listing nearly 4000 scientific papers.

In Finch's case, the work was not done when the gold was dug. Now Finch emerges as curator of a vast and heterogeneous collection, classifying and cataloguing his finds for those who would come and browse. Finch the curator guides us through his collection with an agenda of key questions: How valid is the lifespan as a measure of the rate of senescence? When does senescence begin? At what levels of organization do genes influence senescence? What are the relative contributions of selective (nonrandom) and random changes in gene expression and other cell functions during senescence? How directly do genes operating during development or adult life specify senescence? How do species vary in reproductive senescence, including the total production of gametes and incidence of developmental abnormalities? How much plasticity in senescence arises from environmental (that is, nongenetic) factors? How universal among species are age-related degenerative changes at the organismic, cellular, and molecular levels? When the agenda is reviewed in the closing chapter, we remain a long way short of the definitive answers we would like, but we know much better the limits of our knowledge.

It is probably fair to say that progress in gerontology has so far been slow. The reason can be summed up in a single word: diversity. *Longevity, Senescence, and the Genome* is above all a book about diversity. The diversity begins at the level of individual survivorship. Even if two individuals are physically identical in every respect, the chances are that they will live different lifespans. The moment of death, that ultimate phenotypic character, is strongly influenced by chance. Diversity extends through species' life history patterns, through gene effects on aging within a population, through nongenetic factors like diet and exercise, and through the random, insidious defects that accumulate hour by hour and

day by day in the molecular machinery of the cells. When a subject is as diverse as senescence, what is important to work on assumes a fuzziness quite unlike the problems faced, for example, in cancer research.

And yet, in spite of the immense diversity of its phenomena, gerontology does gain some degree of coherence from the application of evolutionary theory. Successive generations of evolutionary biologists, beginning with August Weismann and Alfred R. Wallace, have refined our understanding of the evolution of senescence to the point where we now have pretty good reason to believe that in a species like our own aging occurs because natural selection places higher priority on turning out progeny to carry our genes forward than on keeping individuals going; in effect, late survival is sacrificed for reproduction. Extending through a more diverse range of reproductive patterns, the burgeoning discipline of evolutionary life-history theory provides us with the intellectual framework to approach questions like why some species get only a single shot at reproduction (semelparity) while others get more (iteroparity) and why species differ in their longevities. Using the theory to good effect, Finch mingles with it his obvious collector's joy in classifying species according to whether they show rapid, gradual, or negligible senescence and, later, in exploring the evolutionary record for clues to how senescence really evolved.

A book as broad-ranging as *Longevity, Senescence, and the Genome* is bound to have some flaws. On the whole, the structure is good. In addition to the extensive bibliography, there are comprehensive indexes of authors, species, and subjects and a glossary. These are essential for a major reference work such as this. Sometimes, however, Finch has relied too heavily on organizing material within chapters on a phylogenetic basis. This is most obviously a problem in the chapter on gene expression and macromolecular biosynthesis, where general concepts are tucked into some oddly narrow slots. I am also somewhat puzzled by two consecutive sections in the chapter on "Negligible senescence" that are headed "indeterminate lifespans and negligible senescence" and "finite lifespans with negligible senescence," since negligible senescence, as Finch defines it, is logically linked with indeterminate lifespan.

But the book as a whole is magnificent. Not since Alex Comfort's *The Biology of Senescence*, last updated in 1979, has there been a book in the field as broad in scope as this one. I am tempted to say that *Longevity, Senescence, and the Genome* is worth its weight in gold, but it is a big book and this would be pushing imagery too far. Suffice it