BOOK REVIEWS

Dobzhansky Revisited

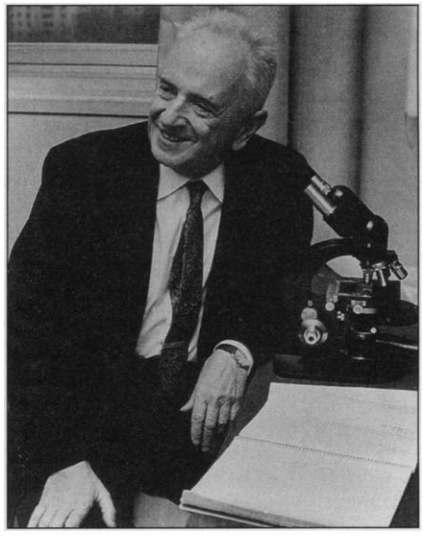
Genetics of Natural Populations. The Continuing Importance of Theodosius Dobzhansky. LOUIS LEVINE, Ed. Columbia University Press, New York, 1995. xiv, 399 pp., illus. $85 or £52.75.

It is not surprising that evolutionary biologists are more preoccupied than other scientists with their intellectual predecessors. Ours is a historical science that pays attention to ancestors, be they the mammal-like reptiles of paleobiologists, the clusters of synapomorphies of cladists, or the interpolated coalescent Eves of population-genetic theorists. This ancestor awareness has spilled over into our scientific culture, becoming in the process a form of ancestor worship. Because evolutionary biology is diffuse, incorporating diverse areas like paleontology, ecology, and molecular genetics, we take as our heroes those who have conceptually unified the field and ritually evoke their names to affirm that we are, indeed, a discipline. It was a great relief when S. J. Gould entitled his first collection of essays *Ever Since Darwin*, effectively retiring that phrase as the shopworn introduction to paper after paper.

Such considerations may explain the production of yet another volume (the fourth, by my count) in honor of Theodosius Dobzhansky. Named after his famous series of 43 papers on *Drosophila* genetics, *The Genetics of Natural Populations* commemorates once again the life and work of one of our century's most important experimental evolutionists. Twenty years after Dobzhansky's death, his students and grand-students have assembled 24 essays in his honor, a third of them personal reminiscence and scientific biography, and the remainder literature reviews and research reports on *Drosophila* chromosome polymorphism, ecological genetics, speciation, and molecular evolution. Although much of the material has appeared in the primary scientific and historical literature, this collection allows us to measure Dobzhansky's contributions at some remove from his life.

It would at first seem unnecessary to reiterate these achievements, which are well known to scientists of a certain age. Nevertheless, Dobzhansky's reputation as a biologist is on the wane: many students seem to think that he was the author of *Crime and Punishment*. The greatest value of this volume may be to parade his accomplishments before a new generation of evolutionists.

Dobzhansky actually had three successive careers. He began as a Russian insect taxonomist, roaming the steppes on horseback in search of ladybugs, and then joined Thomas Hunt Morgan's group at the California Institute of Technology, where he made fundamental contributions to classical *Drosophila* genetics. With this background in natural history and genetics, he launched his third career in 1937 by suddenly disgorging *Genetics and the Origin of Species*, the founding manifesto of the modern synthesis. Solving the problem that eluded Darwin, the book limned an explanation for organic diversity from the first principles of genetics, ecology, and natural selection. *Genetics and the Origin of Species* was enormously influential, going through four editions, and now represents Dobzhansky's most durable contribution to the field. (During his lifetime it accounted for only 10 percent of all citations to his work, a figure that has risen to 40 percent today).



Theodosius Dobzhansky, 1964. [Rockefeller Archive Center]

Had Dobzhansky written only that book, he would still deserve a place in the pantheon of biology. But his achievements were far more numerous. With the book as his research program, he founded the field of experimental evolutionary genetics, conducting 40 years of field and laboratory work on genetic variation in *Drosophila*. He produced the first sensible species concept, outlined an evolutionary scenario for the origin of reproductive isolation, and demonstrated how this scenario could be tested by experiment. He was the first evolutionist to motivate his experiments and fieldwork with mathematical theory. (In an intriguing essay in this volume, Richard Lewontin argues that Dobzhansky, never comfortable with mathematics, was actually a "theoretician without tools," who solved his problems with flies instead of equations). Dobzhansky made fundamental contributions to anthropology, including demolishing the typological view of human "races" as objective, genetically pure entities. He was a tireless promoter of evolutionary biology, who, like his countryman Nabokov, had a remarkable gift for the English language.

Finally, by producing dozens of students and postdocs from many nations (11 represented in this book), Dobzhansky secured a worldwide following. His adherents were drawn by his immense personal magnetism, his deep and infectious love of science, his astonishing capacity for work (he pushed flies to the last day of his life), his strong commitment to his students (in a practice now archaic, Dobzhansky refused to put his name on their papers unless he had actually done some of the work), and his enormous productivity, characterized by his intimidating motto, "A month gone by without a paper sent to the press is a month wasted" (he didn't waste a month for over 40 years!). Our field still bears his stamp in many ways, including the widespread use of *Drosophila* as a model organism and the obsession of evolutionists with the problem of genetic variation.

This combination of charisma and accomplishment explains why Dobzhansky inspired multiple festschrifts, but not why their production continues two decades after his death, or why they seem tinged with a certain defensiveness. As one might guess from the book's subtitle—"The Continuing Importance of Theodosius Dobzhansky"—many contributors recognize that his legacy is shaky and use their essays to shore it up. There are at least two causes of this insecurity, one having to do with Dobzhansky himself and the other with deeper trends in our science.

It is important to realize that Dobzhansky's legacy was not an unalloyed good. As many contributors admit, his personal research program was largely a failure. Hampton Carson, for example, observes that after four decades of arduous work on chromosome inversions Dobzhansky had discovered

Vignettes: Medical Calculation

Consider a precise number that is well known to generations of parents and doctors: the normal human body temperature of 98.6° Fahrenheit. Recent investigations involving millions of measurements have revealed that this number is wrong; normal human body temperature is actually 98.2° Fahrenheit. The fault, however, lies not with Dr. Wunderlich's original measurements—they were averaged and sensibly rounded to the nearest degree: 37° Celsius. When this temperature was converted to Fahrenheit, however, the rounding was forgotten, and 98.6 was taken to be accurate to the nearest tenth of a degree. Had the original interval between 36.5° Celsius and 37.5° Celsius been translated, the equivalent Fahrenheit temperatures would have ranged from 97.7° to 99.5°. Apparently, dyscalculia can even cause fevers.

—*John Allen Paulos*, in *A Mathematician Reads the Newspaper* (BasicBooks)

If you took a sample of one million children and counted their digits at birth, you would find that the vast majority of them had twenty in all, while some might have more and some less. If you displayed this digital variation graphically, you would come up with what statisticians call a normal curve. . . . A practicing doctor would call all of the ten-toe-ten-finger kids normal. In fact, they are a statistical mean.

—*Anne Fausto-Sterling*, in *How Things Are: A Science Tool-Kit for the Mind* (John Brockman and Katinka Matson, Eds.; Morrow)

little more than that they were subject to selection of an unknown sort. Dobzhansky's explanation for chromosomal and genic polymorphism, the superior fitness of heterozygotes, languishes without proof; and it is now clear that his methods could not distinguish among competing hypotheses. Moreover, his work was sometimes sloppy and his methods hardly Popperian. As Lewontin notes, many of Dobzhansky's "experiments" were actually demonstrations of his preconceived notions, and "the conclusions were already in existence *before* the experiments were done." Although Dobzhansky can hardly be faulted for taking on a such a difficult research program, he failed to abandon it when it became intractable, and his lack of success has tarnished his image.

The decline of Dobzhansky's reputation, however, also reflects a general attribute of evolutionary biology: mathematical theory has always been more durable than empirical research. This is not because of any inherent superiority of theory over experiment—our progress has always depended on their interaction—but because much of our history consists of methodological innovations that allow us to apply the same old theories to ever more sophisticated data. So, for example, Dobzhansky's unresolved arguments about the selective basis of chromosome polymorphism became, with the advent of electrophoresis, unresolved arguments about allozyme variation, and are now, with sequencing technology, unresolved arguments about DNA polymorphism. (It is no coincidence that the last two methods were introduced to our field by a Dobzhansky student and a grand-student.) There is, moreover, our curious reluctance to abandon mathematical constructs, such as Sewall Wright's shifting balance theory of evolution, that are attractive but untestable. Such theories linger in the literature for years, nodding at nature but refusing to make her acquaintance. Dobzhansky himself has suffered from the transience of experimentalists. Over the past 30 years, in a burgeoning scientific literature, citations of his work have dropped from 300 to 150 per year, while those of Wright have risen from 200 to 600. One of my colleagues, who has considered his various options for immortality, likes to proclaim, "Why have children when you can have reprints?" But he is an experimentalist, so I always advise him to hedge his bets and procreate.

Reputations decline and citations drop off, but a great deal of inspiration remains in the life and work of Theodosius Dobzhansky. Evolutionists should read him for an education in the history of our field, for his enlightened views on genetics and society, for the sheer joy of his graceful prose, and above all for his approach to studying evolution, now so widespread that we forget its source. Reading Dobzhansky is, however, more than just a dutiful bow to the past. In the midst of the turmoil of World War II, Winston Churchill was rebuked for his preoccupation with British history. His response was that "the longer we look back, the farther we can look forward." The problems raised by Dobzhansky still beset the field, and his works offer refreshment when, weary and befuddled by algebra, we forget that our goal is to understand populations in nature.

Jerry A. Coyne
Department of Ecology and Evolution, University of Chicago, Chicago, IL 60637, USA

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Advice to the Government

Impacts of the Early Cold War on the Formulation of U.S. Science Policy. Selected Memoranda of William T. Golden, October 1950–April 1951. WILLIAM A. BLANPIED, Ed. Directorate for Science and Policy Programs, American Association for the Advancement of Science, Washington, DC, 1995. xliv, 97 pp. Paper, $14.95.

William T. Golden, an investment banker, has long been a devoted and knowledgeable public servant for science. In September 1950, three months after the outbreak of the Korean War, he was asked by the Bureau of the Budget to prepare a report for President Harry S Truman on several key issues in national policy for research and development (R&D). Particularly important were the approaching activation of the National Science Foundation; whether to create an agency for the Korean emergency like the Office of Scientific Research and Development (OSRD) of World War II; and the degree of control that civilians should exercise over military research.

By April 1951, when his inquiry ended, Golden had interviewed about 150 scientists (mainly physicists), military officers, and public officials, some more than once. At the end of each day's conversations, he used a dictaphone to record the details of what was said, accumulating some 200 memoranda, all of which he had transcribed. The transcriptions of the recordings amounted to almost 400 pages, and they are a treasure trove of information bearing on the contemporary state of the military's scientific capabilities and on related issues in federal policy for science.

In *Impacts of the Early Cold War*, William Blanpied has reproduced 27 of these memoranda, provided a list of all the people whom Golden interviewed, and written a useful introduction to his activities that rightly stresses the considerable consequence for science of the Korean War. Blanpied selected for publication those memoranda that supply insight into ongoing issues in science policy and that summarize conversations with fig-