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Review Of "Race Unmasked: Biology And Race In The Twentieth Century" By M. Yudell

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book's central theme of human biology. In this way, the author shows the deterministic framework of physical laws to be necessary but not sufficient to explain the unpredictable and chaotic systems that produce homeostasis in human physiology. Any breakdown of the system's inherent stability, order, or ability to respond to changes in the environment results in disease. The central chapters develop case studies of complexity as a framework for understanding and potentially treating challenging human diseases, including obesity, diabetes, heart disease, cancer, and Alzheimer's.

The final section of *The Complexity Paradox* sketches out a vision for biology and medicine in the 21st century with complexity as the unifying theory to account for most key principles in biology. Mossman argues, for example, that the inherent complexity and indeterminism of organic systems explain why physics-like laws have been nigh on impossible to establish in the biological sciences. Embracing complexity as the central epistemic framework for biology and medicine may well prove to be the next major conceptual shift that facilitates overcoming numerous roadblocks presently stymieing progress. This project will not be simple, however, and unfortunately this volume does not provide readers with a clear foundation for the future. Because Mossman focuses on case studies of complexity in disease medicine, his book never fully explicates how complexity can unify disparate fields in the biological and biomedical sciences.

Well written and fascinating, *The Complexity Paradox* has enough specificity to ensure confidence in the conclusions but not so much as to obfuscate the central message of complexity's importance for medicine to a nonspecialist audience. As such, it will intrigue and educate a wide range of scholars, undergraduates, and general readers on the importance of complexity theory for the future of biology and medicine.

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RACE UNMASKED: BIOLOGY AND RACE IN THE TWENTIETH CENTURY.

By Michael Yudell; Foreword by J. Craig Venter. New York: Columbia University Press. \$40.00. xvii + 286 p.; index. ISBN: 978-0-231-16874-8 (hc); 978-0-231-53799-5 (eb). 2014.

The author, a faculty member at Drexel University's School of Public Health, was educated in history and Soviet studies as an undergraduate, has a master's degree in history, and an MPH and PhD in sociomedical sciences. Although he has done some research in molecular biology, he is not formally trained as a molecular or evolutionary biol-

ogist and devotes a substantial amount of his research time and energy to ethical and public health issues. I will return to this point shortly because I think it bears some consideration.

Yudell's compelling book clearly conveys the passion and commitment he has for probing into the sordid history of the eugenics movement and the role scientists, especially geneticists, played in its perpetuation, both yesterday and today. This is a thoughtful and carefully reasoned work that unmasks the pseudoscientific roots of racism, mainly in the United States. The author follows in the footsteps of other important books examining eugenics and race—i.e., Elof A. Carlson's *The Unfit: A History of a Bad Idea* (2001. Cold Spring Harbor (NY): Cold Spring Harbor Laboratory Press); Stephen Jay Gould's *The Mismeasure of Man* (1981. New York: Norton); Diane B. Paul's *Controlling Human Heredity, 1865 to the Present* (1995. Atlantic Highlands (NJ): Humanities Press); and Daniel J. Kevles' *In The Name of Eugenics: Genetics and the Uses of Human Heredity* (1985. New York: Knopf). My apologies to the many other excellent works I could have mentioned.

The current book begins with a brief foreword by J. Craig Venter in which he puts into perspective the Human Genome Project, and how it informs us about race at the genomic level. He also touches on how genomics has confirmed that modern humans and Neanderthals interbred as recently as 40,000 years ago and what this might say about the genetic composition of modern human populations. Venter raises other complex issues in his foreword as well. He does a superb job of creating a roadmap guiding us to what follows.

The 11 chapters in this book cover topics that range from A Eugenic Foundation, one of the best and most important of the chapters (especially for readers who may not fully recall the tragic historical consequences of the eugenics movement) to a final chapter, Race in the Genomics Age, where we circle back to some of the themes raised by Venter in his foreword. Yudell concludes with a thought-provoking epilogue, Dobzhansky's Paradox and the Future of Racial Research. Here the author explores the idea expressed by many before him that race should not be a factor in public health policy or research. The paradox is this: Dobzhansky, arguably one of the greatest evolutionary geneticists of all time, firmly believed that the *biological* race concept was critical to understanding the origin of genetic diversity in the evolution of biological species. He also understood that "race" is an imprecise term, of limited value, and a term that has enormous potential for abuse. Nevertheless, Dobzhansky vigorously defended the *biological* race concept even though he clearly

recognized the inherent paradox. Race has profound social implications and Dobzhansky urged biologists to keep them separate from the biological issues. This epilogue should be read by students in all fields of study, be they natural scientists, social scientists, or students of the humanities.

This brings me to the point I raised earlier about Yudell's educational history. Even though the concept of biological race is admittedly problematical, it can and should be legitimately employed to illustrate and understand *the* central concept in all of biology: "Nothing in biology makes sense except in the light of evolution" (Dobzhansky). We know, for example, that different populations of the same *Drosophila* species are better suited to survive and reproduce at different elevations of the Sierra Nevada Mountains because of selection acting on genetic differences between populations; and different populations of the same plant species (*Potentilla*) thrive at different elevations in the California Coast Ranges as a result of their genetic differences. Yudell should have explored more critically the biological race concept in greater depth and perhaps focused less on race in a strictly human and social context, for subspecies or races (whatever you want to call different populations) are indeed important entities in the evolutionary process. As François Jacob said: "Anything found to be true of *E. coli* [bacteria], must also be true of elephants." In other words, the evolutionary process as it operates in insects, plants, and other organisms also applies to humans. This may be an obvious point, but the biological race concept is important biologically, historically, and currently.

In spite of this rather minor criticism, this is an important, thought-provoking book and deserves to be widely read by people in all disciplines, but especially by the next generation of geneticists who might need to more fully understand the deep historical roots of their discipline.

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THE LIFE SCIENCES IN EARLY MODERN PHILOSOPHY.

Edited by Ohad Nachtomy and Justin E. H. Smith. Oxford and New York: Oxford University Press. \$74.00. xv + 256 p.; name and subject indexes. ISBN: 978-0-19-998731-3. 2014.

This anthology will be welcomed by philosophers and historians of science. The association between early modern philosophy and mechanical physics has been widely explored, while the relationship between modern philosophy and the life sciences has received less attention. The essays are arranged around four, interrelated themes: the

problem of life; the problem of structure in living beings; the problem of generation; and the question of order in nature. The problem of life concerns the question of whether mere accumulation of data under a current research program will be sufficient to explain the phenomenon of life or whether important biological facts will elude such explanation. In contrast with those who accept the latter disjunct, advocates of the former view find no conceptual or ontological difference between living and nonliving things. Three essays are dedicated to this question. The first, by Nachtomy, concerns Leibniz's distinction between living and nonliving beings and the second, by Raphaële Andraut, contrasts the views of Cudworth and Grew to the more materialist views that emphasize *causa efficiens*. The third essay, by Thomas Teufel, revisits Kant's views, particularly those in the *Third Critique*, where Kant denies there will ever be a "Newton of the blade of grass." One might think there is a "problem of life" precisely because living and nonliving things appear to have structural differences. That the parts of animate beings are functionally integrated in special ways extends to antiquity. Furthermore, living beings seem to adhere to laws very different in kind to their inanimate complements. In connection with structural questions of this variety, Peter Distelzweig discusses Fabricius' teleomechanical account of muscles, Anne-Lise Rey discusses Francis Glisson's account of irritability, and François Duchesneau examines the organism-mechanism question in connection with a Leibniz-Stahl controversy. Some have thought that attempting to explain structure out of nonstructural elements is akin to attempting to generate something out of nothing. Generation itself is, of course, thought to be a mark of the living.

The third set of essays meet up with reproduction. Andreas Blank discusses material causes and incomplete entities in Gallego de la Serna's theory of animal generation, Karen Detlefsen treats Malbranche's account of generation, Catherine Abou-Nemeh looks at regeneration and the limits of mechanism in connection with Réaumur's crayfish experiments in Hartsoecker's *Système*, and Charles T. Wolfe discusses Spinozism as it relates to epigenesis in Diderot's biological project. The final two essays concern the order wherein organisms are placed within nature. The success of the mechanical philosophy issued in questions concerning, inter alia, the status of human beings and persons in relation to other living things. Lea Schweitz considers how Leibniz attempts to understand humans both mechanistically and within *imago dei*. Brian Ogilvie contrasts how naturalists considered metamorphosis among insects in rela-