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6-1-2013

Review Of "Translational Stem Cell Research: Issues Beyond The Debate On The Moral Status Of The Human Embryo" Edited By K. Hug And G. Hermerén

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Recommended Citation

John B. Jenkins. (2013). "Review Of "Translational Stem Cell Research: Issues Beyond The Debate On The Moral Status Of The Human Embryo" Edited By K. Hug And G. Hermerén". *Quarterly Review Of Biology*. Volume 88, Issue 2. 127-128. DOI: 10.1086/670535
<https://works.swarthmore.edu/fac-biology/461>

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of medical genetics in medical schools in the United States and the creation of genetic services for counseling and diagnosis of genetic disorders. He devotes a lot of attention to Victor McKusick for his development of medical genetics as a discipline at Johns Hopkins University and readers will appreciate the detail of how McKusick's career flourished. Comfort shows how the eugenic climate in which these pioneers were initially raised shifted to the basic science needed to identify genes associated with birth defects and later onset disorders.

The difficulty with the author's attempt to bring in the four philosophic themes of his book is that he makes the attempt by physicians to treat disorders (or prevent them after prenatal diagnosis and elective abortion were introduced in the later 1960s) a revival of eugenics or a debatable belief that physicians equate genes to germs (i.e., something to be antiseptically removed). He sees the physicians involved in genetic services as largely motivated by an unconscious eugenic idealism (Comfort calls this "human perfection") to rid humanity of genetic disorders and in the genome age to apply positive eugenics to create the ideal person or a select few persons who typify what can be called a healthy, attractive, intelligent, long-lived person with an agreeable personality. Many physicians who call themselves medical geneticists would take issue with this assessment of their field. Many would argue that they are healers and their role is to treat possible conditions such as sterility or birth defects even if these go on to pass on their innate factors for repeating the disorders in later generations. They would argue that elective abortion is not done for a eugenic ideal ("perfection"), but as a means of reducing suffering by the future parents or an individual for whom no effective treatment exists (e.g., like Tay-Sachs syndrome or Hurler syndrome) and, in any case, that should be the decision of the user of genetic services, not the physician. Although some may reject Comfort's four themes as marginally connected to the practices of human and medical genetics, no one should ignore his concern about potential abuses if we are not vigilant. The past history of such abuses demands such scrutiny of our newly won knowledge.

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TRANSLATIONAL STEM CELL RESEARCH: ISSUES BEYOND THE DEBATE ON THE MORAL STATUS OF THE HUMAN EMBRYO. *Stem Cell Biology and Regenerative Medicine*.

Edited by Kristina Hug and Göran Hermerén. New York: Humana Press (Springer). \$189.00. xxvi + 461 p.; ill.; index. ISBN: 978-1-60761-958-1 (hc); 978-1-60761-959-8 (eb). 2011.

Embryonic stem (ES) cells are cells derived from the inner mass of mammalian blastocysts. They have the very special capability of dividing indefinitely while maintaining the potential to develop into any ectodermal, mesodermal, or endodermal cell type. These special properties suggest human ES cells have the potential to help us not only understand but treat human diseases such as juvenile diabetes, various cancers (CLL), and immunodeficiency disorders, such as Wiskott-Aldrich syndrome. However, obtaining human ES cells requires the destruction of the human embryo, and this creates enormously complex ethical dilemmas, a central core of this book. One way to circumvent these ethical dilemmas is to induce pluripotent stem cell (iPSC) status in somatic cells by reprogramming them (using transcription factors), and this has indeed been accomplished, although there are differences between true stem cells and iPSCs.

Hug and Hermerén, from Lund University's Department of Medical Ethics, have brought together a remarkable group of scholars from various parts of the world to explore the ethical, legal, and social issues that permeate all aspects of ES cell research. The 31 chapters are grouped into 10 parts, each of which explores some aspect of translational stem cell research. The first and longest part (10 chapters) explores translational SC research from the perspective of what is currently possible and what remains to be achieved. Another part (consisting of one chapter) explores the psychological implications of translational SC research. Other parts examine such topics as the patenting of SC-based inventions, communication issues, SC-based therapies, and ethical issues involved in translating SC research knowledge from bench to bedside. The last part of this book looks at the future of translational SC research and SC-based therapeutic applications from the perspective of risks, long-term effects, and priority setting. Hermerén's chapter in this part, the last, is one of the best in this excellent collection.

Translational SC research and technology is moving forward at an exponential pace, but it seems as if our ability to deal with the ethical dilemmas is progressing only at an arithmetic rate. However, the issues and problems raised by the authors of this

thoughtful and thought-provoking collection of papers are timeless and should be read, contemplated, and discussed by all who are directly or indirectly involved in stem cell research.

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CREATING A PHYSICAL BIOLOGY: THE THREE-MAN PAPER AND EARLY MOLECULAR BIOLOGY.

Edited by Phillip R. Sloan and Brandon Fogel. Chicago (Illinois): University of Chicago Press. \$105.00 (hardcover); \$35.00 (paper). ix + 319 p.; ill.; index. ISBN: 978-0-226-76782-6 (hc); 978-0-226-76783-3 (pb). 2011.

The “three-man paper” also known as the “green paper” for its cover as an offprint, appeared in 1935 in the *Nachrichten von der Gesellschaft der Wissenschaften zu Göttingen* (1(13):189–245). Its authors were N. W. Timoféeff-Ressovsky (a geneticist), Karl Zimmer (a biophysicist), and Max Delbrück (a physicist who had just received his PhD from Lise Meitner). Few colleges subscribed to the *Nachrichten*, but the three authors made sure that top geneticists, biophysicists, and theoretical physicists would receive offprint copies. It was, as Delbrück remarked, dead and buried when it was published. Sloan and Fogel use their English translation of the article and supplement it with an introduction, three essays on the historical background associated with the paper, and two philosophy of science essays.

In the historical essays, William Summers discusses the connection of physics to genes from Einstein to Delbrück. Philip Sloan discusses biophysics in Berlin with an emphasis on “Delbrück’s club” that met mostly in his home. Richard Beyler covers target theory research in the 1930s and 1940s. In the section on the philosophy of science, Nils Roll-Hansen discusses reductionism and complementarity in the outlooks of Delbrück and Niels Bohr, whose public lecture, “Light and Life,” inspired Delbrück to shift from physics to biology. Daniel McKaughan explores the question of reductionism in Delbrück, Schrödinger, and Muller’s approaches to the nature of the gene and gene mutation.

The paper has become an icon of the founding of molecular biology, although that term had not yet been coined by the authors. It was read by Erwin Schrödinger who used it to draft his lectures and book, *What is Life?*, which appeared in 1944. Although the essays differ in their stress on relation of the three-man paper to the founding of molecular biology, it is very clear that Bohr and Delbrück were expecting new laws of physics or a direct quantum physical relation to gene mutations. Delving into the past of all the participants and reflecting on their backgrounds and intentions makes this an exciting book to read. We realize that Delbrück entered bac-

teriophage genetics as a founding father to see if viruses as genes could be studied by physical approaches. He had an aversion in those early days to biochemistry, although by the time his phage group explored viral genetics it was as reductionist a field as Muller had anticipated in the 1920s. Delbrück may have shifted to phycomyces research in hopes of finding a more complex system on the relation of photons to biological activity. If he was a reductionist, he was certainly a reluctant one. When I was a young faculty member at UCLA in the early 1960s, Delbrück gave a seminar and left me with two memorable statements. He said, “When I give a talk at USC I am paid an honorarium, when I give it at UCLA I am taken to dinner, and when I give it at Caltech, I pay for the cookies.” It was my duty to host the dinner at a restaurant. I asked Delbrück what he thought of the three-man paper some 30 years later. “Ach,” he replied, “that was a silly piece of work.” I was struck by his integrity because I had learned that when a visitor gave a seminar at Caltech, Delbrück would often say, “By far that is the worst seminar I ever heard.” He judged himself by the same skepticism.

For those reading this book, a lot of important issues are raised. Most molecular biologists are reductionists and reject vitalism. There is always a temptation to revert to holism when complexity does not yield to immediate reductionist approaches. The essays in this volume reveal this struggle throughout the 20th century. Muller was imprinted with reductionism by his mentor, T. H. Morgan, and by reading Jacques Loeb’s works. Timoféeff-Ressovsky shared Muller’s reductionism when they worked together at Berlin-Buch at the Kaiser Wilhelm Institute just before Hitler came to power. Muller was visiting on a Guggenheim Fellowship. Target theory fell into the reductionist approach as a quantitative approach to measuring gene size, but Muller rejected that approach as an oversimplification of the gene, reduced to an abstract unit with a statistical radius. Muller’s gene was far more complex, but he did not fall into the despair of invoking holism. When he left Berlin with Hitler’s rise to power, he went to the USSR where he carried out a series of studies on the gene using radiation-induced rearrangement to produce an analysis that identified the gene as linear with boundaries and inert regions between genes in the yellow-achaete-scute region. That was his response to the target theory gene that had no relation to the physical or chemical structure of the gene.

Roll-Hansen introduces us to a Danish philosopher, Harald Høffding, who argued that science is always incomplete, that it evolves, and each generation will see it in a different way. This contingency resonates to many scientists because new tools lead to new experiments and new interpretations. It is