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By Prof. Matthew Meselson

You young scientists are fortunate to be starting your careers at a time of great discovery in many fields. Fortunate also because as scientists you are joining a worldwide fellowship that will bring you friends all over the world.

Rockefeller University is unique for its superb science and a dedicated round-the-clock community of living, working, and thinking together. I speak from recent experience, having taught a course here three years ago. The title of the course was "Major Advances in Understanding Heredity and Evolution". What I want briefly to talk to you about is the future of heredity - human heredity. No sound explanation of heredity could be developed until 1900, when Mendel's great paper of 1865, ignored for 35 years even though widely available, was finally recognized by biologists. Until Mendel showed that the units of heredity are discrete and do not blend in crosses, it was believed that there was blending. This meant that a variation in the germ line arising in one individual would be diluted by half in the next generation and then a quarter and so on until after a few generations it would have negligible effect. Blending meant there could be no evolution based on individual variation. Darwin avoided this problem by assuming that there was group variation: that changes caused by the use and disuse of body parts could be inherited, as had Lamarck before him. Then if a large number of individuals engaged in the same pattern of use and disuse or experienced the same change in the conditions of life, that would get around the dilution problem -- by having a lot of people with the same variation: No more dilution or much less dilution. After 1900, and after some bitter disputes between Mendelians and anti-Mendelians, progress in genetics was rapid. By about 1935 classical genetics was essentially complete. Complete in the sense that when a colleague at Harvard recently asked me to recommend a book from which he could learn about classical genetics, I recommended Sturtevant and Beadle's "Introduction to Genetics", published in 1939. Classical genetics made possible many beneficial applications in medicine and in crop improvement, especially the improvement of corn and rice.

Now we are about to enter an altogether different era of application of genetic knowledge – improvement of human genomes, eventually including the human germline. This year the National Academy of Sciences National Academy of Medicine Committee on Human Genome Editing released a 243-page report, entitled "Human Genome Editing." Chapter 6, "Genetic Editing", is about replacing germline genes that cause or predispose to serious illness. The committee recommended going ahead with this kind of engineering of the human germline, but carefully, subject to a number of ethical and legal safeguards. Chapter 7 is entitled "Heritable Genome Enhancement". That sort of engineering is not directed toward replacing genes that cause or predispose to serious illness, but rather towards enhancing normal abilities or attributes. The committee recommended against going ahead with germline enhancement at the present time. Nevertheless, it will certainly be done. There are likely to be many problems in editing the human germ line, including the problem of over-dominance and of higher-order epistasis. And it will be essential to recognize the value of human diversity and its relation to the concept of human dignity. As the technology develops for modifying the human genome, we will be increasingly drawn to the study of human origins and the sources of civilization and to the essential question of what it means to be human: what we most value in our humanity. Biologists and other scientists should become a major part of that discussion.

So, especially for the graduating class, let me end with some words of an ancient Greek philosopher , Epictetus. “Take some time out to think about what kind of life you want to lead and what kind of person you want to be.” I wish you the best.