

# “Human Nature”: Documentary explores CRISPR, the groundbreaking development in genetics

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8 December 2020

NOVA: “*Human Nature*,” directed by Adam Bolt and written by Adam Bolt and Regina Sobel

CRISPR, a groundbreaking development in the science of genetics, is the subject of “Human Nature” on the PBS long-running series *NOVA*. The documentary, released on March 10, 2019 but airing on PBS in September, is composed in large part of interviews with the scientists directly responsible for this new technology. It explores the implications of simple mass-produced genetic editing and raises the question: Is society ready for the changes that this new horizon makes possible?

CRISPR stands for “clustered regularly interspaced short palindromic repeats” and in nature they are segments of DNA that work in conjunction with a protein known as CAS9 to provide bacteria and other prokaryotes a system of acquired immunity against viruses. When a bacterium survives a viral attack a “spacer sequence” of viral DNA is saved as an identifying segment within the bacterium’s own genetic data so that this strain of bacteria will be able to defend itself against that viral invader should it be encountered again in the future. CAS9 then is a protein that cuts invading DNA where it matches the reference of its RNA spacer sequence, the genetic data it uses for programming, stopping the viral takeover of the cell then and there. This natural process, once discovered, was very quickly realized to be a means for rapid, mass-produced genetic editing.

The programmability of CAS9 and the natural processes of DNA reduplication have been re-deployed as tools for the targeted cutting, copying and editing of new genetic sequences into working copies of genomes. The documentary vividly compares the ease with which one might now create new genetic sequences as readily as one might sit down at a word processor, and strongly argues that we are on the cusp of a radical change in our relationship with nature and/or own genes. However, a number of passages in the documentary led this viewer to believe that

as long as this technology remains monopolized within the hands of private corporations, those changes will occur along class lines, not for the betterment of society as a whole.

The viewer is introduced to the concept of gene therapy in a relatable manner. The opening scenes of “Human Nature” document the life of David Sanchez and his experience with sickle cell anemia. These scenes are used to introduce the viewer to a common disease that will likely have a genetic cure at some point in the future. Sickle cell anemia is most prominent in people descended from regions with high incidences of malaria, because being born with some sickle cell blood cells offers resistance to the disease. African Americans are more likely to carry the genes for sickle cell because their ancestors lived in regions with more malaria.

Dr. Fyodor Urnov of UC Berkeley walks us through the past failures of the science of gene therapy and explains how CRISPR is going to change the options for many such diseases. He and his colleagues ground their arguments in their personal experience with the science, explaining the mechanics of the genetics simply and clearly for a popular audience. But the medical application is just an introduction to a larger discussion and they warn us not to confuse what comes next with science fiction.

As is fitting for a piece called “Human Nature,” the documentary raises the question of how everyday gene editing will change what it means to be human. Optimistic scenes about eliminating genetic diseases and increasing human longevity alternate with clips from *Gattaca*, *Blade Runner* and *Jurassic Park* that are used to raise questions about the proper ethical use of this technology and the dark ways in which it could be abused. Some of these theoretical problems have already become real concerns. “Human Nature” brings up the case of the researchers in China who are reported to have already altered the genomes of a pair of twin girls for HIV resistance, making them the first humans to be born with genetic alterations.

Jennifer Doudna, a recipient of the 2020 Nobel Prize in chemistry for her work on the CRISPR-CAS9 gene editing technique, relates a nightmare she had about her work in which Adolf Hitler requests a briefing on CRISPR and CAS9. In another scene, Vladimir Putin is invoked, when he speaks bleakly about the possibility of state-sponsored super-soldier programs: “Man can create a man who can fight without fear or pain. This might be worse than a nuclear bomb.” These passages serve two purposes, to acknowledge rhetorically the danger of this Pandora’s box but also to raise the specter of a foreign adversary acquiring the technology before the United States.

Moreover, the documentary makes no mention of how terrifying US imperialism itself could use such technology. One can only imagine how much more murderous mercenary companies such as Blackwater (also known as Xe Services and Academi) would be if they had genetically altered super-soldiers. The same can be said for various police forces, which would be able to inflict domestic repression with a hitherto unseen level of violence.

“Human Nature” raises these objections largely to cast them aside through hand-waving. Bioethicist Hank Greely compares the discovery of CRISPR to the invention of the Model T and suggests that it will “change the biosphere,” while Alta Charo, another bioethicist, is brought on to relativize these concerns: “What you do with the power determines if the result is something we applaud or something we deplore. But it’s not the tool that determines the endpoint, it’s the user,” she says, crossing her fingers for a Star Trek future.

Most troubling of all are the comments of Stephen Hsu, vice president for Research and Professor of Theoretical Physics at Michigan State University, who says, “Well, the concept of eugenics, if you, if you go way back, it really just means good genes. The idea is that the human race could improve itself.” Hsu, who was attacked on Twitter this year with the #FireStephenHSU for his perceived eugenicist views, goes on to say, “What we’re talking about here, where we’re being paid to do these genetic tests by loving parents who want to have a healthy child, to equate that with Nazism is, I think, just, not just stupid but actually insane.” It is hard to hear these passages and not get the sense that for his part at least, the motive for profit outweighs any other concern.

We get some hint in a few ways about the audience that the documentary is targeting. Michael and Paul Dabrowski, the giddy co-founders of Synthego, an online custom gene-editing start up, assure investors in the audience that only people with the proper research credentials will be able to buy access to the technology: “We have a design tool online. Specify a gene that you’re looking to knock out. You can

specify the types of edit that you’re looking to do. You swipe your credit card, and a few days later, a couple of tubes of all the materials that you need show up at your door.”

Really though, the future clientele of on-demand genetic editing is represented by the mother of a girl born with albinism, who asks, “I don’t know where you draw the line between not having albinism and deciding your kid needs to be an extra foot taller, so they can be a good oarsman and go to Yale. Where is that line? Who’s going to draw that?”

Fyodor Urtov, Alto Charo and Stephen Hsu all hope that this technology will be used with the best intentions, but hope is not enough. Despite all the abstract fears about speculative technologies like designer babies, super-soldiers and replicants, the documentary slips over the questions of unequal access to medicine with sly assertions of hope for a better future. Stephen Hsu, who is “also a researcher in computational genomics and founder of several Silicon Valley startups,” says, “In the short term, there’s a disturbing possibility that people with means will be availing themselves of this technology, and people who don’t have those means will not. So, I kind of hope for a future where government makes it free for everybody.” But he offers no ready alternative. In fact, no one in the documentary offers a means to protect the world from the genetic abuses that CRISPR could make possible.

Why does the program dwell on the abstraction of ethical permissibility when it should be spending more time questioning the monopolization of the use of this novel medical technology in the hands of a small but wealthy minority? The producers left a number of clues as to the purpose of the documentary, that is, to assuage the fears of future well-to-do consumers of genetic medicine and tantalize them with a utopian future. However, to secure a future in which all people can enjoy the benefits of genetic medicine and one that can hold in check its worst proclivities, the resources and research of the biopharmaceutical and genetics industry must be seized by the working class and organized for social purpose, not for the enrichment of a tiny layer of rich elites.



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