

CRISPR: God Simulator?

by [Iris \(Jingxuan\) Liu](#)

The ODIN, based in California, is a company that sells do-it-yourself gene editing kits. In one of her essays, *The New Yorker* science and nature writer Elizabeth Kolbert discusses trying out one of The ODIN's products – the “bacterial CRISPR and fluorescent yeast combo kit.” Using the tools, proteins, and bits of “designer DNA” provided in the kit, she successfully edited the genes of *E. coli*, a type of bacteria, “swapp[ing] out one ‘letter’ of the bacteria’s genome, replacing an ‘A’ (adenine) with a ‘C’ (cytosine).” After its genes were modified, the *E. coli* could no longer be harmed by streptomycin, a powerful antibiotic. “It felt a little creepy engineering a drug-resistant strain of *E. coli* in my kitchen,” Kolbert relates. This process gave her “a definite sense of achievement” – but what was the nature of this achievement? Kolbert reminds us of the Norse god Odin, with “only one eye, having sacrificed the other for wisdom.” Odin’s wisdom allows him not only to “calm storms, turn weapons against his attackers, and make women fall in love,” but also “to cure the sick” (“Odin”). It may be surprising that editing genomes – effectively playing Odin – can be so easy.

CRISPR is the technological breakthrough that allowed Kolbert, who had no previous experience in gene editing, to alter the genome of the bacteria in her kitchen. Invented in 2012, CRISPR, or Clustered Regularly Interspaced Short Palindromic Repeats, is a gene editing tool that enables “effortless editing” by “precisely snip[ping] out” or adding any minute piece of DNA within a genome (Kahn). “Some researchers have compared CRISPR to a word processor, capable of effortlessly editing a gene down to the level of a single letter,” says *The New York Times* science writer Jennifer Kahn.

CRISPR offers “a way to rewrite the very molecules of life any way we wish,” says Jennifer Doudna, one of the developers of CRISPR (qtd. in Kolbert). With CRISPR, scientists have created “ants that can’t smell, . . . pigs that resist swine fever, macaques that suffer from sleep disorders, coffee beans that contain no caffeine,” etc. – and the technology has not yet approached its limits. “The heart of CRISPR’s potential,” as Doudna describes, is the “prospect of editing [human] embryos so that they don’t carry disease-causing genes” (Kahn). One can imagine a future without diabetes, Alzheimer’s, and HIV after CRISPR-aided technology has edited our children’s genomes or disabled a virus’s ability to reproduce inside the human body. “We are as gods and *have* to get good at it,” comments Stewart Brand, editor of the *Whole Earth Catalog*, as he considers the new era of CRISPR (qtd. in Kolbert). With this technology,

we could not only make crops more productive and animals less likely to go extinct, but also transform our own species to become immune to disease – much as the god Odin controls other creatures but can also transform himself.

But what would it mean to be good at being gods? When CRISPR debuted in 2012, Doudna predicted “it will most likely be years before we can safely edit the DNA of an embryo” and expressed concern that someone might practice gene editing “before the technology was genuinely ready” (Kahn). In November 2018, Chinese scientist He Jiankui claimed that he had successfully created the world’s first CRISPR-edited babies, twin girls named Lulu and Nana (“World’s First Gene-Edited Babies”). He claimed he disabled the CCR5 genes from the embryos of the twins to prevent any possible future infection with HIV (“World’s First”). The question was: had gene editing really become safe enough to be used on human beings?

The answer turned out to be no. Dr. Kiran Musunuru, a geneticist at the University of Pennsylvania, reviewed He’s experiment data and found “‘clear evidence of mosaicism’ in the edited embryos of both twins” (qtd. in Kolata and Belluck). Mosaicism means that in Lulu’s embryo, only one copy of CCR5 genes was disabled while it should have been both. “It’s as if you took the embryos and dipped them in acid and said ‘You know what, I’m just going to go ahead with the implantation anyway,’” explained Dr. Musunuru (qtd. in Kolata and Belluck). It was clear that gene editing was still not ready for use, but He did it regardless.

By claiming that he created the first gene-edited babies, He became famous overnight. But Lulu and Nana will suffer risks from mosaicism for the rest of their lives, including digestive problems, thyroid problems, and heart defects (Stanford Children’s Health). The Supreme People’s Court of the People’s Republic of China held that He had “crossed the bottom line on scientific and medical ethics” in the pursuit of “fame and profit” and then sentenced him to three years in prison (Wee). The irresponsible and self-serving way He conducted gene editing alerts us that we may not be gods of wisdom like Odin, but a different kind of deity. In the words of Paul Kingsnorth, a British writer and activist, “We are as gods, but we have failed to get good at it We are Loki, killing the beautiful for fun. We are Saturn, devouring our children” (qtd. in Kolbert). CRISPR may enable us to create profound changes to the genes of the next generations, but the effects could turn out to be disastrous due to our lack of responsibility and respect for life.

He Jiankui has received nearly unanimous condemnation from authorities, researchers, and society. His research has been suspended by the Chinese government, and he is now considered “a pariah among scientists” (Wee). His careless attitude toward lives infuriated researchers in the field and also spurred a public outrage. These reactions are reassuring, as they show that most people do not want humans to use CRISPR in a way

that would bring us closer to Loki or Saturn. But it's worth considering whether we want to make ourselves any kind of god at all. The condemnation of He has focused on ethical problems with the processes of his experiments, not on his ostensible goal of freeing people from defects using gene editing.

Sandy Sufian and Rosemarie Garland-Thomson observe that "ridding future generations of terrible diseases" seems to be an "unquestionable" and uncontroversial goal in our society. But it sends an "uneasy alert" to Sufian and Garland-Thomson, who both have genetic conditions that might be considered "serious enough to eliminate from the human gene pool." Sufian lives with cystic fibrosis, a disease that causes respiratory troubles, and Garland-Thomson has a form of syndactyly, causing some of her fingers to be conjoined. Both conditions are inheritable, meaning that their children may experience the same disabilities. People might assume that Sufian and Garland-Thomson would be happy to see a future created by CRISPR where no one has cystic fibrosis or syndactyly, yet the belief that there are supposedly "bad genes" which need to be eliminated is rooted in societal assumptions surrounding ability and disability.

When Garland-Thomson was pregnant, the obstetrician assumed her main concern was passing her genetic condition on to her baby, while her actual biggest concern was finding childcare. Similarly, when Sufian considered having a child, her friends and medical providers questioned her decision, since she would pass down the cystic fibrosis genes to her hypothetical child. Such interactions reflect an assumption that the genes of people with genetic conditions "contaminate the human gene pool," and thus, they "should not propagate and pass those genes on to their progeny" (Sufian and Garland-Thomson). This reveals a deeper idea that people think those "with supposedly 'bad genes' hold a less valuable place in society than others." However, genetic conditions can shape their bearers' lives and become part of their identities in myriad ways. Sufian believes that "the limitations of human imagination make it questionable, if not unethical, for a person to [assume they can] grasp another person's (or group of people's) quality of life fully." Despite their genetic conditions, both Sufian and Garland-Thomson say they have access to good healthcare, their families are very supportive, and both have received educations "suitable to their talents and interests." They assert that people with genetic conditions "don't necessarily suffer *all the time* [and] don't necessarily suffer any more than other people without such conditions." Sufian and Garland-Thomson see the genes that cause their genetic conditions as parts of who they are, not misspelled words that need to be fixed by the 'word processor' of CRISPR.

In his essay "All Animals Are Equal," ethicist and activist Peter Singer claims that "equality [among humans] is a moral idea, not an assertion of fact" (4). The assumption and defense of human equality must take place without regard to individual attributes and abilities: otherwise we might give less consideration, for example, to "the interests

of all those with IQ scores below 100" (4). In a 'utopian future' where genes associated with disability or disease are edited out of existence, the fear of 'bad genes' might extend to the intellectual capacities of future children, never mind their eye or skin color. Such possibilities are morally alarming in a society where all people are supposed to have equal value.

With CRISPR and gene editing, the question we need to ask ourselves is not what kind of gods we are or we wish to become, but whether we should try to be gods in the first place. For, how can we really decide which genes are bad and should be eliminated and which are good and should be dominant without participating in another form of eugenics? This kind of "genetic selection" would not be "enforced . . . by the state," Garland-Thomas points out, and thus would not involve physical violence, but rather a form of "velvet eugenics." As she suggests, a certain kind of implicit violence would adhere to any new human attempt – even supposedly compassionate ones – to assign differences between 'good' and 'bad' genes. Maybe we should just leave it to the gods.

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