Orphan Black Was Never About Cloning - examination of science ethics went far beyond a single technology.

After five seasons of clone cabals, the BBC America/Space series Orphan Black has come to a mostly happy end. Yet an ellipsis follows wrapping of the show, hinting at bigger questions that transcend the characters' storylines. Orphan Black's conspiracies, camp, and Tatiana Maslany's riveting performances as a dozen different clones make it easy to overlook its prescience and profundity. From the opening scene in which Sarah Manning sees her clone kill herself by stepping in front of a train, questions of identity—both existential and scientific—provide the show's narrative thrust. Who created the clones? How? Why? How much control do their creators have over them? The show's final season provides answers while raising questions that transcend science fiction. What role should ethics play in science? Do scientific subjects have the right to self-determination?

If you stopped watching a few seasons back, here's a brief synopsis of how the mysteries wrap up. Neolution, an organization that seeks to control human evolution through genetic modification, began Project Leda, the cloning program, for two primary reasons: to see whether they could and to experiment with mutations that might allow people (i.e., themselves) to live longer. Neolution partnered with biotech companies such as Dyad, using its big pharma reach and deep pockets to harvest people's genetic information and to conduct individual and germline (that is, genetic alterations passed down through generations) experiments, including infertility treatments that result in horrifying birth defects and body modification, such as tail-growing.

In the final season, we meet the man behind the curtain: P.T. Westmoreland, who claims to be 170 years old thanks to life-extension treatments such as parabiosis (transfusions of young blood). Westmoreland wants to harness the healing powers of the particular LIN28A gene mutation found in the fertile clones' kids. (Real-world studies suggest that while LIN28A mutations are linked to cancer, its RNA-binding protein promotes "self-renewal of embryotic stem cells.") Westmoreland—ultimately discovered to be a fraud who assumed the original Westmoreland's identity after he died—personifies one of the show's messages: that pseudoscience and megalomania can masquerade as science. Just because someone has a genetic sequencer and a lab coat doesn't mean he's legitimate, and just because someone's a scientist doesn't mean he's ethical.

Orphan Black demonstrates Carl Sagan's warning of a time when "awesome technological powers are in the hands of a very few." Neolutionists do whatever they want, pausing only to consider whether they're missing an opportunity to exploit. Their hubris is straight out of Victor Frankenstein's playbook. Frankenstein wonders whether he ought to first reanimate something "of simpler organisation" than a human, but starting small means waiting for glory. Orphan Black's evil scientists embody this belief: if they're going to play God, then they'll control not just their own destinies, but the clones' and, ultimately, all of humanity's. Any sacrifices along the way are for the greater good—reasoning that culminates in Westmoreland's eugenics fantasy to genetically sterilize 99 percent of the population he doesn't enhance.

Orphan Black uses sci-fi tropes to explore real-world plausibility. Neolution shares similarities with transhumanism, the belief that humans should use science and technology to take control of their own evolution. While some transhumanists dabble in body modifications, such as microchip implants or night-vision eye drops, others seek to end suffering by curing human illness and aging. But even these goals can be seen as selfish, as access to disease-eradicating or life-extending technologies would be limited to the wealthy. Westmoreland's goal to "sell Neolution to the 1 percent" seems frighteningly plausible—transhumanists, who statistically tend to be white, well-educated, and male, and their associated organizations raise and spend massive sums of money to help fulfill their goals. Critics raise many objections to transhumanism, including overpopulation and the socioeconomic divide between mortals and elite immortals, which some think might beget dystopia. Researchers are exploring ways to extend the human lifespan whether by genetic modification, reversing senescence (cellular deterioration with age), nanobots, or bio-printed tissues and organs, but in the world of Orphan Black we don't have to speculate about the consequences of such work.

The show depicts the scientists' dehumanization of the clones from its first scene, when Beth, unable to cope with the realities of her cloned existence, commits suicide. When another clone, Cosima, tries to research her DNA, she gets a patent statement: "This organism and derivative genetic material is restricted intellectual property." It doesn't matter that Cosima is sick or that she's in love. She's not a person: She's a trademarked product, as are the other clones.

The show's most tragic victim is Rachel, the "evil" clone. She's the cautionary tale: Frankenstein's monster, alone, angry, and cursed. The only one raised with the awareness of what she is, Rachel grows up assured of her own importance and motivated to expand it by doing Neolution's dirty work. Westmoreland signs a document giving Rachel sovereignty, but later she sees computer files in which she's still referred to by her patent number. Despite her leadership, cunning, and bravery, even those working with her never regard her as human. Her willingness to hurt her sisters and herself shows what happens to someone whose experience of nature and nurture is one and the same.

We, the viewers, also dehumanize Rachel by writing her off as "one of them." When she lands on the side of her sisters, she does so not out of morality but out of vengeance. At the end, Westmoreland, the closest thing she has to a father, taunts her: "it's fitting you return to your cage. All lab rats do." But her childhood flashbacks suggest she doesn't want others to experience what she has. When Neolutionists take 9-year-old Kira from her home at gunpoint, Rachel initially supports the plan to load Kira with fertility drugs and then harvest her eggs to access her mutated gene. But when Kira gives Rachel a friendship bracelet (and perhaps her first friendship), Rachel's haunted expression suggests that beneath her usually unflappable demeanor, she's still a frightened little girl. When Kira asks, "Who hurt you?" Rachel responds, "They all did."

Whether motivated by retaliation, morality, or both, Rachel helps save Kira and takes down Neolution. Yet it's unclear what's left for her as she'll never be welcomed into "Clone Club." Her last act is to provide a list of clones around the world so Cosima and former Dyad researcher Delphine can cure them. Rachel gives the clones control over their lives—and in so doing, asserts control over her own. Ultimately, Orphan Black is all about choice. There's much in life we can't choose: our parents, the circumstances of our birth, our DNA. It's no surprise that a show that espouses girl power ("the future is female" is both spoken and seen on a T-shirt in the final two episodes) dwells on the importance of choice.

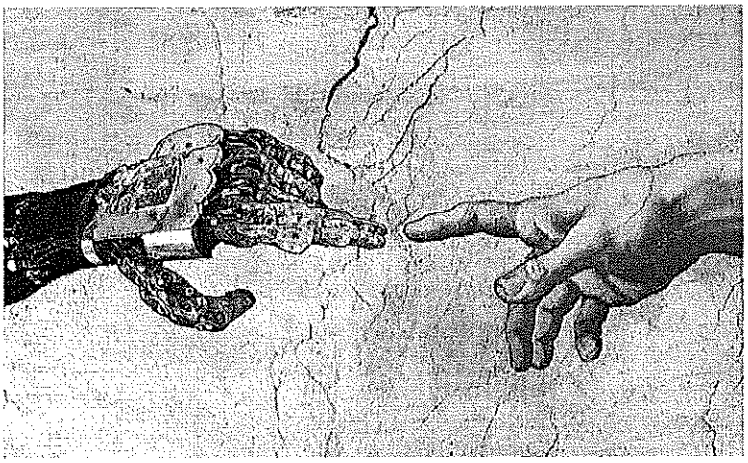
The Future is Female

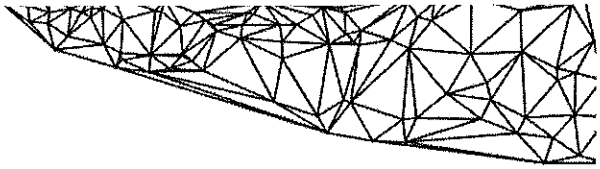
The finale flashes back to Sarah in front of Planned Parenthood debating whether to have an abortion. Reckless, rough Sarah surprises herself (and Mrs. S, her foster mother) by deciding to keep the baby. Years before she learns how many decisions others have made about her body, she makes a decision for herself. On Orphan Black, denial of choice is tantamount to imprisonment. That the clones have to earn autonomy underscores the need for ethics in science, especially when it comes to genetics. The show's message here is timely given the rise of gene-editing techniques such as CRISPR. Recently, the National Academy of Sciences gave germline gene editing the green light, just one year after academy scientists from around the world argued it would be "irresponsible to proceed" without further exploring the implications.

Scientists in the United Kingdom and China have already begun human genetic engineering and American scientists recently genetically engineered a human embryo for the first time. The possibility of Project Leda isn't farfetched. Orphan Black warns us that money, power, and fear of death can corrupt both people and science. Once that happens, loss of humanity—of both the scientists and the subjects—is inevitable.

In Carl Sagan's dark vision of the future, "people have lost the ability to set their own agendas or knowledgeably question those in authority." This describes the plight of the clones at the outset of Orphan Black, but as the series continues, they challenge this paradigm by approaching science and scientists with skepticism, ingenuity, and grit. The "lab rats" assert their humanity and refuse to run the maze. "Freedom looks different to everyone," Sarah says in the finale. As she struggles to figure out what freedom will look like for her—should she get her GED? Sell the house? Get a job?—it's easy to see how overwhelming such options would be for someone whose value has always been wrapped in a double helix. But no matter what uncertainties their futures hold, the clones dismantle their cages and make their own choices, proving what we've known all along—their humanity.

This article is part of Future Tense, a collaboration among Arizona State University, New America, and Slate. Future Tense explores the ways emerging technologies affect society, policy, and culture.



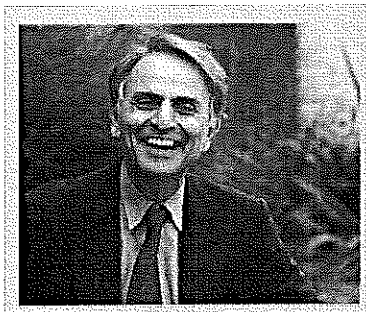


What is Transhumanism?

Transhumanism is a way of thinking about the future that is based on the premise that the human species in its current form does not represent the end of our development but rather a comparatively early phase.

Transhumanism is a loosely defined movement that has developed gradually over the past two decades.

> *Transhumanism is a class of philosophies of life that seek the continuation and acceleration of the evolution of intelligent life beyond its currently human form and human limitations by means of science and technology, guided by life-promoting principles and values.*
>
> – Max More (1990)



"I have a foreboding of an America in my children's or grandchildren's time — when the United States is a service and information economy; when nearly all the manufacturing industries have slipped away to other countries; when awesome technological powers are in the hands of a very few, and no one representing the public interest can even grasp the issues; when the people have lost the ability to set their own agendas or knowledgeably question those in authority; when, clutching our crystals and nervously consulting our horoscopes, our critical faculties in decline, unable to distinguish between what feels good and what's true, we slide, almost without noticing, back into superstition and darkness."

—Carl Sagan (1934-1996) in his 1995 book *The Demon-Haunted World: Science as a Candle in the Dark*