Future of the Human Body, Biotechnology & Transhumanism

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The human species has self-awareness, which means that we form identities over the course of our lives. One's concept of self can include relationships, possessions and other physical and mental attributes.[1] Out of all the components which form our self-identity, the body is the most directly visible. When we need to dig deep into who we are, we often look in the mirror. We think about and analyze existence in terms of our perceptions of the physical world. And to understand how we fit into that world, we look at ourselves as a part of the subjective physical experience. As the physical embodiment of the self, the body roots and enables perception of other components of self-identity within the physical world. But this element of self-identity is by no means fixed. As long as humans have existed, we've changed our bodies by any means available.[2] Whether painful and dramatic or subtle and temporary, these changes are attempts to mold the body as a way of shaping identity.

There are many motivations that could be at play when it comes to forming an identity: there are social factors such as cultural definitions of beauty and success, self-driven desires toward a given identity, and a human drive toward perfection. In each case, technology can change the human body to advance the progression of identity. This is increasingly true with rapidly advancing technology, such as synthetics, prosthetics[3] and genetic engineering.[4] While much of this technology is still in its infancy, the rate of progress indicates that it will be ready for mass consumption within just a few decades.[5] Human

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[1] Schouten, J. (1991). Selves in Transition: Symbolic Consumption in Personal Rites of Passage and Identity Reconstruction. *Journal of Consumer Research, 17*(4), 412-425.

[2] Ibid

[3] Ellis, H.L., Asaolu O., Nebo V., and Kasem A. (2016). Biological and synthetic mesh use in breast reconstructive surgery: a literature review. *World Journal of Surgical Oncology, 14*(121).

[4] Kaiser, J. (2016). First proposed human test of CRISPR passes initial safety review. *Science.*

[5] Youn A. (2012). 6 Extreme Body Enhancements to Expect in the Next 10 Years. *The Huffington Post.*

beings crave the ability to control every element of their physical makeup, including creating the appearance of traits, as well as their underlying genetic composition ("the real thing").

When limitless body modification becomes available, human society might undergo radical shifts, including a decrease in emphasis on beauty. One of the more provocative outcomes of body-altering technology might have to do with eliminating the physical borders between the sexes and between different races. While this future could be one with even greater diversity and the disappearance of body-related insecurity, it could also be one of conformity. We already see physical differences create powerful animosities between different groups, with more powerful demographics exerting control over the less powerful. Greater control over these physical differences could allow those with access to body modification technologies to reinforce existing power hierarchies. Regardless of potential consequences, it is clear that increasingly powerful body-altering technology and eventually, possibly, transhumanism will enter the scene.[6]

In such a large globalized society as that of 2016, humans must fight for their position among the "winners." While there are many other ways to be an adequate competitor, physical characteristics can define one's success. Appearance, in many ways, determines how one can function within mainstream society. Evidence suggests that attractive children receive more love and affection from their parents[7] and more encouragement and guidance from teachers.[8] Once adults, these people are offered more lucrative employment opportunities[9] and have an easier time finding romantic partners.

In *Assuming a Body: Transgender and Rhetorics of Materiality*, Gayle Salamon describes the body as "a construction that always takes place in a social world."[10] She describes the body as a social "construction" because of the role others play in constructing a sense of self. We have little sense of ourselves without comparing ourselves to others. The difference in experience between those who are and

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[6] Ibid

[7] Langlois, J.H., Ritter, J.M., Casey, R.J., and Sawin, D.B. (1995). Infant attractiveness predicts maternal behaviors and attitudes. *Developmental Psychology, 31*(3), 464-472.

[8] Clifford, M., & Walster, E. (1973). The Effect of Physical Attractiveness on Teacher Expectations. *Sociology of Education, 46*(2), 248-258. doi:10.2307/2112099

[9] Little, A.C. & Roberts C.S. (2012). Evolution, appearance, and occupational success. *Evolutionary Psychology, 10*(5), 782-801.

[10] Salamon, G. (2010). Assuming a Body: Transgender and Rhetorics of Materiality. *Columbia University Press*.

aren't judged as beautiful reinforces the body as a form of social capital. Most humans understand the value of different bodies, whether consciously or otherwise. In *Selves in Transition: Symbolic Consumption in Personal Rites of Passage and Identity Reconstruction,* John Schouten reinforces this idea when he writes, "the less complete or secure people feel in roles or statuses to which they are committed, the more likely they are to use stereotypical symbols of role competency to reinforce perceptions of adequate performance."[11] Perhaps unintentionally, society has been built around physical judgement, which amounts to opportunity and exclusion. In this regard, humans try to understand how they fit into and are or aren't accepted by society based on their physical appearance.

When humans fall short of knowing or living up to their desired self, they are likely to change their bodies in an effort to advance in life. "One characteristic that makes humans unique among living creatures is our ability to examine ourselves, to find ourselves lacking, and to attempt self-betterment. This sense of incompleteness drives us not merely to create, but also to self-create, and we consume goods and services in the process."[12] Body modification products and services are a deeply ingrained in most human economies. Socialized beauty standards are used to sell product and reinforce those standards as truth. We are raised into a society that makes us believe that the body is paramount to life potential. In wanting the best life possible, human beings covet bodily perfection.

As Nathaniel Comfort writes in *The Science of Human Perfection: How Genes Became the Heart of American Medicine*, "it is the dream of control, of engineering ourselves, of not leaving our future up to cruel fate." This inclination, "the eugenic impulse," is the desire to fully control the body paired with the belief that doing so will yield happiness.[13] But humans can achieve happiness in many ways. Believing that a sustainable source of happiness would be bodily perfection, human beings develop some pathology that conflicts with real identity and its lack of perfection. Solving problems by becoming more

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[11] Schouten, J. (1991). Selves in Transition: Symbolic Consumption in Personal Rites of Passage and Identity Reconstruction. *Journal of Consumer Research, 17*(4), 412-425.

[12] Ibid

[13] Comfort, N. (2012). The Science of Human Perfection: How Genes Became the Heart of American Medicine. Yale University Press.

physically "perfect" is a sexy idea. It is this very idea that leads consumers to buy products and services from businesses which further reinforce beauty standards and create cyclical body insecurity.

Most modern humans use over-the-counter beautification products and services. Packing your hair with keratin proteins might make it look more healthy and vibrant. Wearing nail polish and makeup brings a form of artistic expression to the body and allows one to conceal and emphasize as needed. Then there are methods such as scarification and tattooing, which alter the body itself.[14] Piercing ears, which is a combination of these two categories of modification, is standard practice in most parts of the world. Some cultures practiced artificial cranial deformation, the process of molding the growth of a baby's skull to be more elongated to conform with regional beauty standards through the 1950s.[15]

While some of these ancient methods are still in use today, there are more powerful methods of bodily modification, which incorporate modern technology. In 600 BC, a surgeon in India operated on a patient who'd lost his nose. Using a piece of cheek, the surgeon reconstructed the patient's nose.[16] Cosmetic procedures have been around for thousands of years, but germ theory and medical technologies paved the way for more advanced procedures. There were 15.9 million cosmetic procedures in the US in 2015. This was a 2% increase from the year before, demonstrating a large and growing desire among US residents for surgical beautification.[17] These surgeries are specialized and give people unprecedented control over their physical appearance. Botox treatments give patients thicker lips. Chemical peels result in younger and healthier looking skin. Liposuctions get rid of fat and help patients achieve a culturally-accepted ideal in terms of their weight. Rhinoplasties let patients choose the form of their noses. Breast augmentations and reduction are appealing to patients who want to be more sexually alluring.[18] The cosmetic technologies that facilitate more complex operations include anesthetics, electrosurgical

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[14] Polhemus, T. (1978). The Body Reader: Social Aspects of the Human Body. New York, NY: Pantheon.

[15] Blackwood, B., & Danby, P. (1955). A Study of Artificial Cranial Deformation in New Britain. *The Journal of the Royal Anthropological Institute of Great Britain and Ireland, 85*(1/2), 173-191. doi:10.2307/2844190

[16] Feldman, E. (2004). Before & After. *American Heritage, 55(1).*

[17] American Society of Plastic Surgeons. (2015). 2015 Plastic Surgery Statistics.

[18] Donohoe, M. (2006). Women's Health in Context: Cosmetic Surgery Past, Present, and Future: Scope, Ethics, and Policy. *Medscape.*

equipment for making alterations, microscopes and digital sensory equipment, and other biotechnology for synthesizing organic materials, such as skin grafts.[19]

In spite of these advances and what is to come, humans are currently severely limited in what we can do to our bodies. Cosmetic surgeries do not necessarily translate to physical improvement. They may instead result in health issues, deformation and regret.[20] Surgical enhancement is viewed as less beautiful than staying natural. Most cosmetic surgeons attempt to artificially create natural-looking enhancements. These enhancements can very easily build up to look freakishly unnatural. There is often no viable recourse for reversing the damage of plastic surgery. These shortcomings of surgical methods indicate that the future of body modification involves directly editing the body's underlying genetics. Preliminary research in mice suggests that we might be able to regrow or even modify body parts in adults using genetic engineering.[21] However, we're far more likely to customize the genes of our offspring. The current "best" gene editing technique, CRISPR, could be used on germ cells, which would introduce modified bodies for future generations.[22] But even gene editing is limited. By this method, changing the body is still a procedure. Ideally, the body could be a more fluid and changeable structure. With the ability to shapeshift at will, human beings could more actively express the inner-self through the body. Only then would the body be a fully-customizable and equal canvas for self-definition. Given our current technological limitations, however, individuals sometimes struggle to adapt their physical bodies to their internal identity.

Bodily identity isn't only determined by our relation to others. As Patricia Gagne and Richard Tewksbury write in *Knowledge and Power, Body and Self: An Analysis of Knowledge Systems and the Transgendered Self,* "Rather than being a relatively static and fixed aspect of self, the body has the potential to become a project through which individuals endeavor to present an internalized concept of

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[19] Ibid

[20] Honigman, R. J., Phillips, K. A., & Castle, D. J. (2004). A Review of Psychosocial Outcomes for Patients Seeking Cosmetic Surgery. *Plastic and Reconstructive Surgery*, *113*(4), 1229–1237.

[21] Takeo M., Chou W. C., Sun Q., Lee W., Rabbani P., Loomis C., Taketo M. M., and Ito M. (2013). Wnt activation in nail epithelium couples nail growth to digit regeneration. *Nature, 499*(7457), 288-232.

[22] Kaiser, J. (2016). First proposed human test of CRISPR passes initial safety review. *Science.*

self or identity."[23] Humans experience extreme distress when the concept of self-identity is not reflected in the body. We can experience body dysmorphia, where identity doesn't stem from the body and where the body feels alien and unnatural.[24] Additionally, transgender people often experience dysphoria because they do not inhabit the body they feel they were meant to have. In a study of transgender women, "respondents described themselves in early life as being feminine and most happy when they could freely 'be themselves' or enact what they perceived as authentic selves."[25] In cases such as that of transgender people, the limited set of body change options is detrimental to identity. Gender reassignment feels like a critical surgery, but even then falls short of being a complete solution that fundamentally changes sex. The bodies that these groups want cannot be recreated or given to humans at will. If a transgender woman wants male genitalia, there's little he can do. Fortunately, biotechnologies see great enough rates of improvement that this might change in the near-term.

The human brain can be modified to work with new body parts and sensors. Engineers at the Applied Physics Lab of Johns Hopkins University created a prosthetic arm that connects to the nervous system and functions exactly as a human arm would.[26] On May 8th of last year (my birthday), a surgical team at Massachusetts General Hospital successfully executed the first ever penis transplant.[27] It is becoming increasingly possible and safe to reconstruct and attach human body parts. Several people have opted to receive magnet implants, which provide curious "body artists" with the ability to sense and perceive magnetic fields, reportedly giving the world a new layer of depth.[28] These three examples are possible because of the flexibility of the human brain, which has millions of neural pathways that rewire to adapt to new input. If the human brain gets connected to new limbs or sensory mechanisms, it can

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[23] Gagné, P., & Tewksbury, R. (1999). Knowledge and Power, Body and Self: An Analysis of Knowledge Systems and the Transgendered Self. *The Sociological Quarterly, 40*(1), 59-83.

[24] Vashni N. (2016). Obsession with perfection: Body dysmorphia. *Clinical Dermatology, 34*(6), 788-791.

[25] Gagné, P., & Tewksbury, R. (1999). Knowledge and Power, Body and Self: An Analysis of Knowledge Systems and the Transgendered Self. *The Sociological Quarterly, 40*(1), 59-83.

[26] The New York Times. (2015). Prosthetic Limbs, Controlled by Thought.

[27] Grady, D. (2016). Cancer Survivor Receives First Penis Transplant in the United States *The New York Times.*

[28] Norton, Q. (2006). A Sixth Sense for a Wired World. *Wired.*

incorporate them.[29] Using new biotechnology, humans aren't limited to simply fixing and enhancing the current human body. We can, thanks to our brain, extend the body and create new kinds of functionality and beauty. One surgeon aims to construct functional wings that can be surgically attached to human beings, thus giving us the ability to fly.[30] The brain could understand magnetic poles from the magnetites of pigeons, electrical currents from the electroreceptors of sharks or infrared from the heat pits of snakes. Oncoming biotechnology and the flexibility of the human brain could result in entirely new ways of experiencing the world. Expanding human perception and enabling new bodies altogether, biotechnological extension suggest a future where humans are no longer solely "human."

Even with all of the potential benefits (most of which we can't yet conceive), there are serious concerns about this technology. The first and greatest threat is unforeseen health consequences, such as defects and cancer.[31] Assuming the technology can overcome these drawbacks, there are still social and power-related risks. The creators of biotechnology can capitalize on human insecurity and body dysphoria. We already see these phenomena as corporations sell beauty products that cater to and perpetuate insecurity. Large conglomerates and industry leaders benefit from creating beauty standards that mislead and hurt human beings. There is endless self-interest in the field of biotechnology. This self-interest could result in technological momentum that discriminates or oppresses diversity in human beings. As social scientist Charis Thompson said in an interview in *Clinical Chemistry,* "We have to make sure that we stop tiny segments of the population imposing their ideas on the rest of us."[32]

Genetic engineering of new senses and abilities, whether physical or mental, could give modified humans significant advantages over others. This would put immense pressure on parents to engineer their children. Wanting to provide equal opportunity and the best shot at life for their children, parents would have no good option other than to engineer their children to meet new standards. The children themselves wouldn't have a say in this practice and cannot consent. Rather than nature and mate choice being the

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[29] Weaver, J. (2014). How Brain Circuits Adapt to Changes in Sensory Experience. *PLoS Biology*, *12*(2), e1001802.

[30] Slater L. (2001). Dr. Daedalus: A radical plastic surgeon wants to give you wings. *Harper's Magazine*, July 2001, 57-67.

[31] Skerret, P. (2015). Experts debate: Are we playing with fire when we edit human genes? *STAT.*

[32] Vasiliou S., Diamandis E., Church G., Greely H., Baylis F., Thompson C., and Schmitt-Ulms, G. (2016). CRISPR-Cas9 System: Opportunities and Concerns. *Clinical Chemsitry, 62*(10), 1304-11.

determinants of physical identity, it would be the parents' call. Children frustrated by their bodies would rightly pin that frustration on their parents, who were pressured into deciding their children's physical identities for them. With such fine-tuned control over biology, the pressures to conform could extend beyond a parent's drive to give their children the tools to succeed.

In a future with advanced body modification technology, human diversity might disappear altogether. Humans are biased toward similarity, a concept known as "homophily."[33] But while similarity breeds cooperation and acceptance, difference can breed hate and rejection. Whether that rejection is caused by inherent difference or a human desire to create boundaries between the self and the "other," the rejection remains. As medical professionals and parents strive to eliminate all "negative" elements of human identity, they may cross ethical boundaries. For example, a developer of artificial hearing technology might believe herself to be fighting against a "bad" condition. Yet a deaf person might view it as a blessing and a fundamental element of identity. While society (or the artificial hearing developer) might view a specific physical condition as in need of repair, there could be no true need to make the modification. "The debate stems from a fundamental disagreement: one group sees deafness as a disability, and the other group sees it as a culture. The trouble is that the former group holds a disproportionate amount of power, and the latter group are the ones affected."[34] There are many arguments that members of the majority could make as to why surrendering the deaf identity is necessary. Someone whose life is devoted to music and has great appreciation for auditory sensation could argue that a deaf person doesn't know what he or she is missing. Those providing employment opportunities could argue that hearing is necessary for functioning in the workplace. Meanwhile, the deaf person could argue that they are content with and even grateful for who they are and the culture they are a part of and that to change themselves would lack integrity. But with pressure from the majority, one might opt out of being in the minority. In hypothetical examples of conformity, individuals achieve better quality of life, yet it means surrendering their identity and living a drastically different life.

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[33] Mussweiler, T., & Ockenfels, A. (2013). Similarity increases altruistic punishment in humans. *Proceedings of the National Academy of Sciences of the United States of America, 110*(48), 19318–19323. http://doi.org/10.1073/pnas.1215443110

[34] Ringo, A. (2013). Understanding Deafness: Not Everyone Wants to Be 'Fixed'. *The Atlantic.*

In creating and defining our own bodies, humans might become transhumans, or people who transcend the current limits of human capacity. Transhumans might even diverge enough from modern humans to become an entirely new species.[35] In the case of transhumans, the most defining changes would be incurred by the brain. Transhuman species could break free of many physical and mental constraints, challenging the human species' position as the dominant form of life. Transhumans who drive their own evolution could be better competitors than those who choose to remain the product of natural evolution, which is slower and less precise. The human and transhuman races might find a way to coexist in harmony. Yet they might see each other as too great a threat. Transhumans would have significant power over humans. This could result in segregation, breaking humanity apart into factions. The worst-case scenario is war between these factions. We saw this at the beginnings of human history with Neanderthals. *Homo sapiens* and Neanderthals did not co-exist for long. *Homo sapiens* outcompeted and interbred with *Homo neanderthalensis*, until the latter ceased to exist.[36] From a purely functional perspective, transhumans will be more capable of achieving greater universal complexity. For this reason alone, it is likely that transhumanism will become the new standard and modern humans will go extinct. While there might be some push-back at first, it is unlikely that humans will value their limitations enough to deny the opportunity to transcend the human condition. While the transition between humanity and transhumanity could take many years, protest and radical human fundamentalists, the end result could come about rather peacefully. Cultural body standards could even help facilitate this change

Halting the transition to transhumanity is going to be very difficult because of human frailty in itself. Social pressure and identity don't outweigh basic survival. Depending on the rate of resource consumption on earth, we might need to find a home.[37] We cannot survive in environments without oxygen, temperatures within a strict minimum and maximum, or food and water. While we evolved to survive on earth, we aren't likely to stay on earth. This is a great roadblock because earth's environment is rare and we are unlikely to find it anywhere within the reach of our spaceships.[38] One way to overcome

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[35] Owen, J. (2009). FUTURE HUMANS: Four Ways We May, or May Not, Evolve. *National Geographic*.

[36] Hogenboom, M. (2015). Why are we the only human species still alive? *BBC Earth*.

[37] Cumming, V. (2016). How many people can our planet really support? *BBC Earth*.

[38] Gleiser, M. (2012). How Rare is the Earth? *NPR Science.*

this roadblock is to terraform nearer planets (having them adapt to us). But terraformation is a long, costly,–not to mention–hypothetical process. The more sustainable solution, is to adapt the human body to new environments, thereby becoming transhuman. At this point, transhumans can live and reproduce throughout cosmos.

The physical form of transhumans might be fluid, but this shape-shifting wouldn't be the most extreme step in the body's evolution. In taking its evolution a step further, it's important to note that there are always going to be limits to what the physical body can do for us. As we push these limits, we might find that our very roots in the physical world are limits unto themselves. We cannot predict the technological capability of a future society of transhumans. But, if their technology permits abandoning physical form altogether and existing in another, purer form, they might go down such a path. The known physical world is bounded by the laws of physics. To fully-explore our existence we might be able to break free from these laws. If the universe is a physical container for our existence, there might be some sort of container holding the universe as well. In breaking free from our physical form, we might also break free from our universe. Escaping our universe might be the very beginning of this evolutionary tale. It's dubious that there is a "final frontier," and humans could self-modify forever in an endless effort to reach an most outermost existence. This inquiry might go well beyond science and get us closer to the source of existence. We might find infinite parallel and parent universes or universes which loop back into one another. Maybe we'll find that we're alone and an anomaly in nothingness. Perhaps we'll discover what lies outside of existence, and perhaps we'll hit a brick wall. Perhaps we'll learn what we want to become next, and perhaps in doing so, we'll find God.

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