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Biohacking and Transhumanism: what and why

Biohacking y transhumanismo: qué y por qué

A concept that used to belong to the computer world (hacking) is now connected to life (bio) sciences. With no great difficulty, life is being conceived as a set of data, DNA as a code, the body as a machine, and the mind as software... all able to be read, manipulated, and now even hacked. But manipulated by whom? Biohackers and DYIbio (*do-it-yourself biology*) communities want biotech to be available to anyone, and the information to be openly shared. In this work, I propose a reflection about what is happening and why it might be happening. In the first part, I present biohacking as a social phenomenon, giving some examples of biohackers and differentiating types of biohackers. In the second part, I address Transhumanism. The existence of biohackers is only possible thanks to the increasing availability of information and biotechnology combined with a certain mentality. My main objective is to deepen the reflection upon the relationship between biohacking and Transhumanism. I analyse biohacking as one of the expressions of this movement and one of the phenomena that contributes to it. In the end, I offer a reflection on the culture, desires, and fears of our society and acknowledge some of the questions they provoke.

#biohacking, #DYIbio, #enhancement, #transhumanism, #social phenomena.

Un concepto que solía pertenecer al mundo de la informática (*hacking*) ahora se combina con las ciencias de la vida (bio). Sin gran dificultad, hemos empezado a ver la vida como un conjunto de datos, el ADN como un código, el cuerpo como una máquina y la mente como un software..., todos susceptibles de ser leídos, manipulados y ahora incluso hackeados. ¿Pero manipulados por quiénes? Las comunidades de biohackers y DYIbio (*do-it-yourself biology*) quieren la biotecnología disponible para todos y la información compartida abiertamente. En este trabajo, propongo una reflexión sobre *qué* está pasando y el posible *por qué*. En la primera parte, presento el *biohacking* como un

fenómeno social, dando algunos ejemplos de *biohackers* y diferenciando tipos. En la segunda parte, hago un acercamiento al transhumanismo. La existencia de *biohackers* solo es posible gracias a la creciente disponibilidad de información y biotecnología combinada con una cierta mentalidad. El principal objetivo es profundizar en la reflexión sobre la relación entre *biohacking* y transhumanismo. Analizo el *biohacking* como una de las expresiones de este movimiento y uno de los fenómenos que contribuyen a él. Al final, ofrezco una reflexión sobre la cultura, deseos y miedos de nuestra sociedad, reconociendo también algunas de las preguntas que estos provocan.

#*biohacking*, #*DYIbio*, #*enhancement*, #*transhumanismo*, #*fenómenos sociales*.

PART 1: WHAT

1. Biohackers

Before jumping into a definition, it would be helpful to consider some biohackers. Keoni Gandall performed his first cloning experiment at age of 12. Back in 6th grade, he found a virology textbook at the local church book fair, he thought it was «pretty cool» (Gruber, 2019, p. 1) and began reading it. In 7th grade, his biology teacher saw that Keoni was really interested in the subject, so the teacher let him order a bacterial transformation kit for Keoni to do at home. Today, without formal training or a degree, Keoni is working at Stanford University and leads the *Free Genes Project*, to make DNA biotechnology more accessible to the general public (Cf. Gruber, 2019, pp. 1-2).

Keoni has no plans to go to college. «What value would it add to my life, and what would the opportunity cost be? Seeing my friends go through it, it doesn't seem very attractive: high levels of stress, midterms on things that will later be completely useless to me, and being forced to take classes you don't care about. All for a piece of paper at the end of it [...]» «I'd rather learn from a network of brilliant people who care about what they're doing» (Gruber, 2019, pp. 1-2).

Here we have some other examples:

Gabriel Licina is famous because he managed to achieve night vision by injecting Chlorin e6 into his eyes. Neil Harbisson has been coined as the first android recognized by a government and has implanted an antenna in his skull which helps him to hear colors since he was born with achromatopsia. Tim Cannon managed to implant a chip the size of a deck of cards in his arm. The chip transfers information such as his temperature to his android device (Giannkouloupoulos *et al.*, 2017, p. 294).

Quite different from Keoni Gandall, these last three people self-experimented and made modifications to their own bodies. Let us see one more interesting case to illustrate the phenomenon of biohacking: in 2012, the University of Copenhagen's Medical Museum collaborated with the local DIY (*do-it-yourself*) biology community to create a DIY biology lab. The protagonists suggested that «hacking may be a useful framework for thinking about co-curation» (Davies *et al.*, 2015, p. 117)

Rich Lee, who is in the field of human enhancement and augmentation technology, stays informed about government and university projects and DIY biohacking projects. In 2018, Rich Lee was interviewed by Newton Lee, Chairman of the California Transhumanist Party. In this interview, he addresses biohacking as a solution to the non-affordability of high technologies and shows the opposition of biohackers to political governance over the body.

In the end this means that transhuman technology will be a product for the rich. If you are not rich but want these advantages for yourself or your children, you may have only one alternative: become a biohacker. [...] I am not willing to wait 10 or 20 years for some government to approve a certain intervention related to my transcendence. I do not even observe their right to approve or disapprove the things I wish to do with my body. I don't care about economic impact evaluations, ethics review boards, or social impact studies. The fact is that when these technologies become available they will be used no matter what the popular or legal opinion is. If not by your country, then by another. If not on the open markets then in the underground markets (Lee, 2019, p. 500).

2. Types of biohackers

Considering the people who identify themselves as biohackers, we observe a good variety of bioactivities. It is possible to divide biohackers into two categories: naturalists and interventionists. The first group focus on self-hack or self-help, promoting natural ways of living or how to make the best out of yourself. They seem to be the majority on the biohackers' websites. Then there are biohackers who are in favour of interfering with their bodies either by making use of drugs or by using the help of technology (Giannkoulopoulos *et al.*, 2017, p. 193).

While recognizing the distances between different types of biohackers, we can say that «As the word implies, a biohacker is a life scientist who combines biology and technology, along with the hacking ethos of open data and open source software» (Giannkoulopoulos *et al.*, 2017, p. 292).

The biohacker can be understood as the bio subgenre of the hacker, adapted to the life sciences and technologies (Cf. Sánchez, 2014, p. vi).

3. Biohacking as a social phenomenon

Biohacking or *do-it-yourself biology* (DIYbio) is growing as a social movement. It is being referred to as *open science* and even *the democratization of science*. (Cf. Giannkoulopoulos et al., 2017, p. 292). Exploring the collective identity of the DIYbio movement, an author said that «The DIYbio movement coordinates collective action for social change on a political level as it aims to democratize biology and create a commons of the means of production, and on a cultural level by promoting a work ethic of freedom of inquiry and sharing under a collaborative commons». (Sánchez, 2014, p. vi)

The so-called *democratization of science* also calls to mind *democratic transhumanism*, as Hughes envisioned it. The movement would ensure that technologies are safe, available to everyone and that respect the so-claimed right of individuals to control their own bodies (Cf. Hughes, 2004).

Others would say biohacking is turning democracy upside-down:

In a «CRISPR democracy», citizens take the place of scientists when they, as biohackers, start tinkering with DNA, under the guise of «democratizing» the life sciences. The other way around, scientists take the place of citizens when their voice becomes decisive in the governance of highly controversial technologies that may have a lasting impact on no less than the future of humankind (van Beers, 2020)

Knowledge is power. «In whose hands does all this power lie, or will it eventually end up? It is extremely risky for a small part of humanity to have it» (Acta Apostolicae Sedis, 2015, p. 77, n.104), Pope Francis said referring to technologies. But at the same time, it is also risky for anyone to experiment with biology.

Without a doubt the biohacking phenomenon concerns bioethicists. For instance, the Nuffield Council on Bioethics, a prestigious British Bioethics Council, reorganized its work according to what they see on the horizon for bioethics. After a couple of years analysing the priorities and doing a horizon scanning (Cf. The Nuffield Council on Bioethics, 2020b)¹, they included biohacking as one of the priority topics for the present and future for bioethics. In its short description, we find:

Biohackers apply the hacker ethic to change or enhance the human body using, for example, devices and implants, gene editing, drugs and pathogens. The emphasis is on self-experimentation, creation, and modification of existing technology. Should biohackers be prevented from harming themselves, and do they pose a threat to national security? (The Nuffield Council on Bioethics, 2020a, p. 5).

¹ To see an illustration of the Horizon scanning: <https://view.genial.ly/5e16ffdd753abd1738ec1631>

Leaving risks aside, the fact is that the *do-it-yourself biology* (DIYbio) is a social movement. It is as easy as ineffective to consider this matter by jumping from the *what* to *should it be allowed?* The question of bioethics, law, governance and even education is posterior. To choose wisely the venues of action, it is important to understand *why* biohacking is an increasing social phenomenon. The existence of biohackers is possible only because of the increasing availability of information and biotechnology combined with a certain mentality. It is not simply the result of an amount or a type of technology nor the product of open sources. Clearly, biohacking would not be possible without the increasing availability of specific tools and all the information shared on the internet. But there are always ideas behind a social phenomenon and at the same time, a social phenomenon challenges our view and presents new ideas.

This is *what* is happening. Let's now think of *why* it is happening, approaching the phenomenon of biohacking and the Transhumanism trend of thought.

PART 2: WHY

1. Transhumanism

Transhumanism is not easy to define. That is because, on the one hand, the word «transhuman» is employed to describe several things at once. On the other hand, because as Bostrom² says, we are not talking about «a philosophy with a fixed set of dogmas [...] The ideology is meant to evolve and be reshaped as we move along» (Bostrom, 2001).

It is well known that Julian Huxley³, an evolutionary biologist and the first Director-General of UNESCO, used the word Transhuman in his book *New Bottles For New Wine*, in 1957.

The human species can, if it wishes, transcend itself —not just sporadically, an individual here in one way, an individual there in another way, but in its entirety, as humanity. We need a name for this new belief. Perhaps transhumanism will serve: man remaining man, but transcending himself, by realizing new possibilities of and for his human nature (Julian Huxley, 1957, p. 17).

The core idea of «realizing new possibilities of and for human nature» remains in the later *Transhumanist FAQ*. It was developed through the inspirational work of many transhumanists,

² Dr. Nick Bostrom is a Swedish-born philosopher with a background in theoretical physics, computational neuroscience, logic, and artificial intelligence, as well as philosophy. A founder of the World Transhumanist Association, he is the author of numerous publications. Currently, he is a Professor at Oxford University, where he leads the Future of Humanity Institute as its founding director (Cf. Bostrom, n.d.).

³ Julian was the brother of another famous biologist, Andrew Huxley, and of Aldous Huxley, the author of *Brave New World*. They were grandchildren of Thomas Henry Huxley, known as the «Darwin's bulldog» for the public support of his friend's evolutionary ideas (Cf. Desmond, 2021).

including Alexander Chislenko, Max More, Anders Sandberg, Natasha Vita-More, James Hughes, and Nick Bostrom. There we find the following definition: «**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**» (Humanity+, n.d., p. What is a Transhumanism?).

Today, transhuman can be considered as a transition to posthuman (Cf. Humanity+, n.d., p. What is a Transhuman?), with «better» physical, intellectual, and psychological capacities comparing to a «normal human» (Cf. Bostrom in Postigo, 2009, p. 268). As for the posthuman «[...] it is difficult for us to imagine what it would be like to be a posthuman person. Posthumans may have experiences and concerns that we cannot fathom, thoughts that cannot fit into the three-pound lumps of neural tissue that we use for thinking» (*What Is Transhumanism?*, 2020). Or, as it was once said, «Il postumano non ha volto» (The posthuman has no face) (Malo, 2017, p. 8 The translation is ours.) Transhuman, instead, is somehow closer to us. Therefore, transhumanism is an easier idea to accept, especially in times of confusion between therapy and enhancement, with the coexistence of curative, palliative, preventative and also augmentative actions in medicine (Cf. Sandberg, 2013). But being a transhuman means to *start a process* of fusion with technology and to abandon a status of mere biology (Cf. Benanti, 2012, pp. 136-137). Transhumanism and Posthumanism are therefore connected, even though they are far from meaning the same thing.

Much more than an ideology, Transhumanism is

the intellectual and cultural movement that affirms the possibility and desirability of fundamentally improving the human condition through applied reason, especially by developing and making widely available technologies to eliminate aging and to greatly enhance human intellectual, physical, and psychological capacities (Humanity+, n.d., sec. The Philosophy of Transhumanism).

Some of the means to reach the Transhuman goals are genetic manipulation, nanotechnology, cybernetics, pharmacology and computer simulation. (Cfr. Pessini, 2018, p. 165) As we saw in the examples, hacking is already being done in many of these fields.

2. Relationship between biohacking and Transhumanism

Firstly, we can foresee the relationship between Biohacking and Transhumanism in the very characteristics of biohacking (Cf. Karlovitz, 2020, p. 13):

- *Ordinary people*: not only scientists, but also people with no proper degrees. Even when the biohacker himself might hold a scientific diploma, he is inviting laypeople to do the same.

- *Huge amounts of information available*: the improvement of scientific and technological knowledge gives new possibilities.
- *Technical tools cheaper than ever*: what used to be very expensive and available only to big labs, is now at hand being sold for a cheap price on the internet and delivered home.
- *People share their explanations and analyses through social media*: the Commons-Based Peer-Production (Cf. Sánchez, 2014) is possible because of social media. Biohackers use and increase open sources.
- *Science and high tech as part of everyday life*: biohackers want high biotechnology to become available in the same way other technologies became part of our daily life. As the futurist Martine Rothblatt said, to see some examples of how technologies tend to become available, it is worth remembering that, in their beginnings, eyeglasses, electricity, television, flights, mobiles⁴ were once a luxury. (Cf. Rothblatt, 2015, pp. 147-148).

There is no doubt as to why technology always democratizes. It is as simple as this: (1) people want what makes life better for other people (generally this entails technology), (2) satisfying popular wants is in the self-interest of those who control technology (both technology originators and government regulators), and (3) over time the magnitude of these two factors overwhelm any countervailing forces (such as cultural bugaboos or fears of losing control). The wanted technology becomes available, either because scales of production make it cheaper, innovation makes it more accessible, or officialdom finds its interests better served by channelling rather than blocking the wanted technology (Rothblatt, 2015, pp. 148-149).

Nick Bostrom, in *In Defense of Posthuman Dignity*, says:

Transhumanists promote the view that human enhancement technologies should be made widely available, and that individuals should have broad discretion over which of these technologies to apply to themselves (morphological freedom) [...] (Bostrom, 2005, p. 203).

Let us illustrate the characteristics of biohackers with a concrete and famous case. In October 2017, Josiah Zayner, who had worked for NASA, became the first person to modify his own genes with CRISPR. The modification aimed to increase muscular strength. He performed the self-experimentation at a live conference on Facebook. According to him, the goal of that was scientific, but also cultural. The logic he follows is that if people can modify their bodies with tattoos, piercings, and operations to have the appearance they wish, this self-determination

⁴ As mobile phones became more sophisticated, more people bought into the idea that a mobile had many benefits. Twenty-two years after its invention, in 2009, half the world's population already had a personal mobile phone. Half of Africa's one billion people owned a mobile phone. India's mobile subscribers were almost half of the country in 2010, according to a UN report. Shockingly, in India there are more people who have mobiles than people who have access to proper sanitation facilities, says the report; only about 366 million Indians have a toilet (Cf. Rothblatt, 2015, p. 148).

should be respected also for genetic alterations. To complete the circle of biohacking characteristics, Zayner also made available to the world the tools to follow his example. He published online a Guideline to human CRISPR and started selling a kit for 20 dollars with DNA that helps muscular growth. As he said in an interview with BuzzFeed News, high biotechnologies such as CRISPR should be available for people to do what they want and not remain constricted to a monopoly of academics and pharmaceuticals. (Cf. Benanti, 2020, pp. 104-106) In this case, we can clearly see how he *invites ordinary people* to use the *huge amount of information available* and to get *tools for an accessible price*, he *shares the information on social media* and aims to *make science and high-tech part of everyday life*.

Secondly, we can say that Biohacking is one of the expressions of Transhumanism, one that manifests its influence already here in our culture. As the important transhumanist Natasha Vita-More wrote, DIY strongly exemplifies transhumanist behaviour. (Cf. Vita-More, 2019, p. 52) Vita-More explains her affirmation:

Transhumanist thinking may have been a catalyst that prompted curiosity and the desire to find solutions in areas of knowledge gathering critical thinking, ethics, and visionary foresight in developing new social narratives. [...] the do-it-yourself mentality in being «self-responsible» for their own well-being, and through this, helping their loved ones to be better too, and this sentiment, or this intelligence trickles across society like a chain of paying it forward like an infectious smile that keeps giving. (Vita-More, 2019, p. 52)

Transhumanism and biohacking are both phenomena starting from the bottom. They are not the implementation of a carefully thought-out plan, but results of the primacy of praxis over theory. We could say that they are at the same time products and producers of technology which is more and more available. Furthermore, we can agree with Natasha Vita-More that transhumanist thinking may have been a catalyst for DIY mentality. Biohacking also shows that Transhumanism is not merely an intellectual but also a cultural movement, especially when biotechnologies are used for what Vita-More calls «self-responsibility» and then «helping» others «like a chain of paying it forward» (Cf. Vita-More, 2019, p. 52).

Thirdly, we can consider what biohackers mean and might become for Transhumanism. In the process of «improving humanity» and reaching the Transhuman and later the Posthuman, biohackers might be key agents pushing towards this goal. As an analogy, we can recall that in 2018, though human germline gene editing was not allowed, and the scientific community was against it, a Chinese scientist nevertheless did it and announced he had used CRISPR-Cas 9 in human embryos when the twins were already born (Cf. Marchione, 2018). So, we can imagine how law and other attempts of governance would be efficient to control biohackers.

This work is not about how much is too much, neither is it centred on biorisks⁵ or bioethical considerations. More than a *yes* or *no*, or *how to handle*⁶ biohacking and DYIbio, it is focused

⁵ To see a biorisk chain model (Cf. Sandberg & Nelson, 2020).

⁶ About the topic, an interesting reading is *The FBI and biohackers: An unusual relationship* (Wolinsky, 2016).

on *why it is happening*. Even if biohacking were always safe and allowed everywhere, *what is it telling us about our society, the man of our time and his questions?* Here is where the relationship and the mutual influence between biohacking and Transhumanism become more evident.

Biohacking is one of the expressions of a transhumanist way of thinking. As the cyborg is «expression of the culture, the desires and the fears of the man who thinks of it and implements it» (Benanti, 2012, pp. 51-52 The translation is ours.), biohacking is another expression of the culture, desires, and fears of our society, combined with the existence of technologies able to create and implement such ideas (Cf. Benanti, 2012, p. 143).

3. Biohacking and Transhumanism as expressions of our culture, desires, and fears

Finally, let us see the relationship between biohacking and Transhumanism, analysing important aspects of our culture, desires and fears and recognizing some of the questions they provoke.

- *Culture*: there are many ways to approach our culture, but this work will focus on one that is important for understanding biohacking: the culture of the synthetic⁷. For synthetic we refer to something made artificially, but chemically no different from the natural one. After the advent of the synthetic in 1856⁸, we are now used to many synthetic things as colourants and medicines. Perhaps we are less familiar with synthetic biology. But back in 2010, Venter, an American geneticist, said he had created the first form of artificial life: the bacteria *Mycoplasma capricolum* was completely made in a lab (Cf. Benanti, 2018, p. 91). Will we go from synthetic bacteria to synthetic gametes? The Nuffield Council on Bioethics has already enlisted «*in vitro* derived gametes» and «synthesizing entire human genomes» as topics in its horizon scanning (Cf. The Nuffield Council on Bioethics, 2020a, pp. 2-3). But the important point here and now is that the synthetic blurs the line between natural and artificial, and also between a supposed «natural man» and a «technological/artificial man». It challenges the traditional view of life, man, and technology. The very name of biohacker implies a vision of life that is related to a computer. In this culture, our

⁷ To explore more deeply the topic of a culture of the synthetic (Cf. Benanti, 2018, pp. 13-15. 20-25).

⁸ William Henry Perkin attended the Royal College of Chemistry, in England. He was a fellow of Prof. August Hofmann (German, who introduced the term *synthesis* in 1843, with the idea that it is possible to produce artificially natural elements). In 1856, Perkin, aged 18, was trying to reproduce synthetically quinine that naturally can only be found in plants from Central America, and was important for its use against malaria. The experiment did not succeed, but when he was cleaning up, he saw that the resultant substance was a clothe colourant (colour mauve velvet) more efficient than the natural ones used in that time (Cf. Benanti, 2018, pp. 13-15).

- culture of the synthetic, life sometimes seems to be a set of data ready to be read, controlled, and, as we said before, even hacked. Our culture ends up questioning what is natural and what is artificial, and even if these categories are enough or at least adequate.
- *Desires*: the desire to go beyond, to have a better life, and when possible, to avoid death. Desires that are not original to Transhumanism, but old as mankind. Man is a being that wants to go beyond and that is not wrong. Nowadays this desire seems to be translated into enhancing man and the environment through directing evolution. The centre moved from *being* to *functioning*. In this view, the question is not *what is life* but instead *how it works* so we can control and direct it? We find here a powerful idea at the foundation of Transhumanism: now is the time we can and should direct evolution. «*Not what humanity is, but what it could be!*» (Young, 2005, p. 32) University of Cambridge It seems that co-evolution or self-directed evolution is considered the *natural* step now. And if we make the question: *to direct evolution towards where?* It does not seem to be a question of metaphysical ends, but instead, the goal or the pursued direction is to function better as if it would guarantee a better existence.
 - *Fears*: the fear that the tools and information necessary for achieving the desires would be monopolized by a social or scientific elite, and not be available. This concrete fear is based on the idea that we will not survive or have a good life unless we interfere with our biology. And this idea is rooted in the experience and fear of our own limits. Neither is this fear new, even though the current translation of this fear might be. We agree: trying to overcome limitations is not bad. The point is, without a clear idea of *what is life* or man, there can be no boundaries to any of the attempts to overcome limitations. So, we can easily stop seeing limitations solely in relation to our capacities and start to have problems with ourselves, not only with some of our characteristics. As Simon Young stated in *Designer Evolution: A Transhumanist Manifesto*: «We have nothing to lose but your biological chains!» (Young, 2005, p. 32) University of Cambridge But, if we lose our biology, what will we be? Will WE be?

4. Conclusions

Biohacking makes visible some aspects of our culture, desires, and fears, within the frame of Transhumanism. Moreover, even if biohacking were never risky or forbidden, it would still be worthy of consideration due to the important things it tells us about the man of our time, his questions, and aspirations.

In this work, we considered *what* biohacking is and *why* we are seeing this increasing social phenomenon. Biohacking occurs and DIY communities are increasing partly because they have the means to do it (tools and information), and partly because more and more people agree to the reasoning that we should make biomodifications, and anyone should be allowed to do it, not only

academics and big labs. This reasoning shows the influence of Transhumanism, especially in the culture, desires, and fears of our societies that it manifests. And, at the same time, the praxis of biohacking contributes to express and spread the transhumanist way of thinking.

After seeing the questions of *what* and *why*, there still remains the question of *should we?* These three questions respond respectively to a *social phenomenon*, a *mentality*, and *bioethics*. If we focus only on *what*, we miss all the heart of the phenomenon (*why*). Showing the relationship between biohacking and Transhumanism was the objective of this work, and not addressing here the third question (*should we?*) is one of the limitations of the present article.⁹

There are also remaining questions that invite us to go further, especially if we consider biohackers and transhumanists that defend morphological freedom.¹⁰ Some of these questions are: Is there a human genetic patrimony that needs to be protected or it is a collection of data that can be modified? Is there a type of body that *is* or *is not* human (even though the hybrid might be considered rational)? Is there a kind of right to customize the body at a genomic level? And if yes, how would we define our belonging to the species? Do we actually have a kind of absolute biological freedom so DIYbio should have no limits regarding this?

Without a doubt, praxis changes our vision and provokes questions. In the present case, biohacking and Transhumanism end up challenging our understanding of technology, biology, and man. It makes visible the difficulty we have nowadays with these topics and the need to deepen our understanding of them. This challenge is not necessarily bad, and it can be a good opportunity. We know that even true definitions can still be improved. It does not mean that such definitions were wrong, but that new knowledge, technologies or social phenomena might shed light upon some aspect and force us to go deeper into the reasoning, finding new ways to explain the same reality.

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⁹ In addition to the bioethical question and connected to it, there will be the need to answer *how to handle* (governance) the biohacking phenomenon. Regarding this, the recent document *Human genome editing: a framework for governance on the Global Governance of Human Genome Editing* mentions some risks of DIY and also exposes biohackers' public influence (Cf. WHO Expert Advisory Committee on Developing Global Standards for Governance and Oversight of Human Genome Editing, 2021, pp. 19 and 37).

¹⁰ Anders Sandberg, for example, defends a right to morphological freedom and argues it would not eliminate humanity but it would rather express humanity even further (Cf. Sandberg, 2013).

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