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## Human-Technology Relationships in the Digital Age

### The Collapse of Metaphor in Biohacking

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## *Chapter 4*

# Human-Technology Relationships in the Digital Age

## *The Collapse of Metaphor in Biohacking*

Moa Petersén

### INTRODUCTION

In their (2012) book *Inventive Methods*, Celia Lury and Nina Wakeford argue that methodology hasn't developed in the same pace as the renewed interest for empirical and interdisciplinary studies within social and cultural sciences. Postphenomenology is among those theoretical frameworks where methodology lags behind. Postphenomenological methodology is still searching for a stable level of validity. As the digital culture and technology increasingly encapsulate our everyday lives, it is high time to find one. To quote Diane P. Michelfelder, "Now is a good time to be a postphenomenologist" (Michelfelder, 2015, p. 237).

The relationship between humans and technology within postphenomenology is a complicated one. The easy part is that there *always is* a relationship. There are no humans separated from technology and no technology separated from humanity —there are only hybrids. Postphenomenological theory on human-technology relations departs from four human technology relations observed and theorized by Don Ihde (1990): embodiment relation, alterity relation, hermeneutic relation, and background relation. Newly developed biotechnologies and VR environments demand new technology relations to be articulated, as they "fuse" with our biological body in a way not prior seen (Verbeek & Rosenberger, 2015, pp. 20–21). In my recent, ongoing, research I have set out to investigate biohacking groups as plausible new arenas for bio-knowledge production. In the following

text, I will discuss how the human-technology relation I've found within the Swedish biohacking community becomes an important factor in explaining biohacking as new arena for civic science.

My investigation has so far shown that, in the biohacker community, the fusion between the biological body and technology seems to be rather radical: the biological body is believed *to actually be* a computer system, or better, a system of information. In my research project, I have chosen to analyze this fusion from a postphenomenological perspective; and in the following text, I will give examples of the methodological complexity of such a project. I have faced three main methodological problems that will be specifically addressed in this text. First, is it methodologically possible to use Ihde's technology relations in order to map the biohacker informants' relations to their biological bodies if the boundary between body and technology has been eradicated? Second, how can we move between a network level of the larger knowledge-producing community of biohacking, and the individual level where the biohackers' personal experiences are analyzed? Third, what is the validity of a study like this?

This text is based on my ongoing empirical research, and these three methodological questions will be discussed in relation to my account of my research process and results so far. In the first section, I open with a discussion of the possibilities a postphenomenological researcher has to transition from a network level to an individual level (and vice versa) in the same study. I then briefly contextualize biohacking—and also say something about self-hacking, which is a related phenomenon that is used occasionally in the text to further pinpoint my methodological challenges. In relation to this, I point out the human-technology relationship(s) I have found among the informants in terms of the “collapsed metaphor,” and relate these to Ihde's embodiment relation, as well as to Ihde's theory on body one/body two (2002). This section is followed by some methodological reflections on validity of postphenomenological studies in general. After this, I explain and give examples of my efforts to find methodologically satisfactory post-phenomenological solutions to carry out a study of the *maker approach* within new environments for bio-scientific production. By combining the concept of *biomedia* and the concept of *scientific literacy*, I suggest that we in biohacking groups—and perhaps in other new civic knowledge-producing environments as well—can see a biomedia transition from metaphori- zation to automatization, as learners are collectively engaging practically with the material in a way that does not presuppose, or even wish for, prior theoretical knowledge about explanatory models or their inbuilt metaphors. It is my overall hypothesis that a collapse of metaphor within these new science-producing environments boosts a “maker approach,” as the stage of scholarly

theoretical metaphorization is erased and the learners instead are led directly into the automatized stage that encourages activity and hands-on engagement with a material.

## **FROM BODILY SELF-UNDERSTANDING TO ACTIONS WITHIN THE NETWORK**

This study takes place on two levels: when mapping the Swedish biohacking movement, I have studied rhetorics, discourses, and actions using a netnographic method. When moving to the individual perspective, I have made deep qualitative interviews with two members of the movement, aimed at identifying the informants' perceived relations to technology and their biological bodies.<sup>1</sup> By comparing the results from the interviews with Ihde's four technology relations, I have tried to postphenomenologically map what relations to technology are present among the movement's members. Two interviews is not sufficient empirical material for drawing confident and valid conclusions; this text should therefore be seen as the account of a pilot project, and the arguments put forward here should be treated as ideas rather than truths.

The transition back and forth between the level of the networked Swedish biohacker organization and the individual level of the biohackers' perceived personal beliefs toward their relation to their biological bodies and technology, made me undertake investigations into the possibilities of combining an Ihdean perspective with a more Latourian approach. The focus of my study lies at the formation of biohacking as a new arena for bio-scientific knowledge production, and the aimed result thus belongs more to a network level. Nevertheless, I believe postphenomenological theory and methodology which, in contrast to, for example, an ANT perspective, take the human body into account, provide an effective way to lay bare certain human-technology relations that I am convinced are shaping the overall methodology and scientific approach of the biohacking movement. Therefore, what my study needs is a marriage between an ANT perspective, through which actants and actions as parts of a larger scientific network can be studied, and a postphenomenological perspective that sees to the individual and existential bodily self-understanding. In my opinion, the level of bodily self-understanding has a high impact on the formation of the overarching biohacking system. In *What things do* (2005), Peter-Paul Verbeek shows how Don Ihde's and Bruno Latour's seemingly contradictory perspectives actually can be amalgamated. Verbeek argues that the very kernel of Ihde's and Latour's perspectives are the same—to overcome the subject-object distinction; and, comes to the conclusion that they can complement each other. The main difference that Verbeek sees is how the concept of mediation differs between the

two perspectives. To Latour, a network is shaped by how the actants (that is hybrids of humans and their tools) within that network act. For Ihde, mediation theory deals with the experience of the world that the individual human has through or with technology. Verbeek argues that both thus overcome the distinction between object-subject, but in slightly different but coupled ways (Verbeek, 2005). Ihde sees the two theoretical systems as resting on “interrelational ontologies,” but that the philosophical traditions where these ontologies come from differ. The more semiotic approach within ANT thus collides with the embodied phenomenology of postphenomenology (Ihde, 2015).

In my study, I have followed the path outlined by Verbeek as I argue that the two methods can complement each other. I have not tried to fuse them into each other, but rather let them complement each other from separate places. In summary, I believe it is crucial to study the actions (hands-on methodology) of the actants (the members of the biohacking movement) within the network (biohacking movement) in order to understand the formation (new arena of knowledge production) of this network. But, I argue, in order to understand the actions, it is also crucial to understand the experiences (perceived human-technology-body relations) of the individual members of the network.

## **CONTEXT: BIOHACKING**

The biohacking movement was established in the United States in 2005. In summary, the biohacking movement conducts forms of genetic engineering outside of institutional settings. Experiments are varied but can include, for example, building lab equipment or analyzing human or animal genomes. Biohacking is a scattered phenomenon in the sense that it contains a lot of different subgroups with different types of research interests, goals, and ideologies. Sociologist Alessandro Delfanti has described biohackers as “life scientists whose practices exhibit a remix of cultures that update a more traditional science ethos with elements coming from hacking and free software” (Delfanti, 2013, p. 1). I have concentrated my research on the Swedish non-profit biohacking organization BioNyfiken. BioNyfiken is the only biohacking organization in Sweden and was established in 2014. It consists of three subgroups located in the three main cities of Sweden: Stockholm, Göteborg, and Malmö. The three subgroups together have approximately 750 members (as of November 2015). Within BioNyfiken Sweden, research is focused on making RFID/NFC implants into the human body, by manipulating the brain through electrical impulses to optimize its performance, and by hacking bacteria and DNA. The methods of engaging with the biological material are very hands-on.

The implants, the brain manipulations, and the DNA-hacking are all described as being possible to carry out using household equipment. For instance, the brain manipulation machine (tDCS) is built with a Wettex dish cloth, tinfoil, an old mouse pad, and hot melt adhesives.

BioNyfiken Sweden is partly integrated with Quantified Self Stockholm, a nonprofit organization for self-trackers (564 members in November 2015). Also, the Quantified Self movement is of US origin, and was founded in 2007 by *Wired* magazine editors Gary Wolf and Kevin Kelly. This community, as such, is not central to my study, but in this methodological reflection I will use it occasionally in order to further explain the technology relation present within the biohacking community. In the self-hacking movement, so-called Quantified Self-technologies (QS-technologies)—such as health applications, sleep trackers, and fitness trackers—are used to extract and review biological body data in order to manipulate and optimize the bodily organism or its “output” and “performance.” One of the main concerns that Quantified Self Stockholm and BioNyfiken Sweden share is optimization of personal and public health. It is believed that body-hacks will lead to increased individual and public health through heightened individual responsibility. The strong aim of life improvement often found within biohacker and self-hacker groups is an ethos appropriated from computer hacking environments (Levi, 1984/2010; Delfanti, 2013, pp. 12–13). As part of this hacker ethos, both communities contest the system where large established institutions are in charge of research on the human biological body and medicine. Biohacking and self-tracking both point to their possibilities of solving problems that institutionalized research has hitherto failed to solve.

When blog posts and home pages are analyzed, an explicit analogy of human biological body and computer(-system) comes forth in the rhetorics of both movements. The human body is conceptualized as possible to hack, optimize, and control. This is not true only for the Swedish examples, but serves as a general belief also for the movements on an international scale. On the homepage of one of the largest self-hacker movements in the world, Self-hacker.com, for example, we can read, “As an individual, you are your own architect or software engineer that need to program your body based on your requirements.” Likewise, my interview material shows that informants from both movements tend to describe their biological bodies as computerized systems, or systems of information. BioNyfiken operates on a more societal level, as their main goal is to contest the established bio-research system by providing the general public with a new scientific environment outside of the bio-research industry and academia. The members of Quantified Self Stockholm, on the other hand, are more interested in personal bodily optimization. Thus it would be fair to propose that BioNyfiken is

more into hacking the scientific system and the general human biological system, while Quantified Self Stockholm is more concentrated on hacking the personal bodily system to optimize bodily factors, such as personal strength, health, and endurance.

## THE COLLAPSED METAPHOR

I started the analysis by looking at the verbal use of the body/computer(-system) analogy that I had found both within the organizational rhetorics and the personal statements. Since Ihde's theory on human-technology relations neither includes thoughts on the "pure" human biological body (compare body 1/body 2) or body-technology verbal metaphorization, I turned to theories on the metaphor in order to open up the material collected. George Lakoff and Mark Johnson (1986) have famously argued how metaphors shape actions. But how this action is shaped in reality is relatively under-explored and under-theorized (van der Weele & van den Boomen, 2008). In this project I argue that something I call "the implosion of the metaphor" encourages action within the biohacker environment.

In the case of BioNyfiken, the relation to technology seems to have moved inside the body and merged with the relation to the bodily biological self. How can we explain this from a postphenomenological view? First some clarifications. The conceptualization of the biological human body as a computer system which is possible to "hack," control, or optimize, present within the biohacker movement, can be interpreted from many different perspectives. The most obvious would perhaps be as part of a long-lived cultural futurist trope of the cyborg (i.e., Haraway, 1991) that in more recent years—fueled by fast-developing inventions on the biomedical consumer market and of wearable technology alike—has fused with a transhumanist ideology. Further on, technological metaphors for the human body are by no means a novelty. Both the scientific explanatory models of the biological body, as well as the popular concept of the body, have a long history of mirroring technological development, and new technological innovations (Coleman & Fraser, 2011). Within biological science, explanatory models to the biological body that contain metaphors from the digital sphere—such as code and information—have a long history (Kay, 2000; Keller, 2002). Eugene Thacker has researched the metaphorical development within biology induced by the formation of bioinformatics during the 1980s, where data science and biological science amalgamated to an extent not prior seen (Thacker, 2004, p. 33). Without investigating it further Evelyn Fox Keller notices how both the border between organisms and computers, and the border between computer science and organism science, gradually have been made more and more porous as an effect of developments of computer programs and computer visualization

techniques that have narrowed the epistemological gap between sample and its carried data (Keller, 2002, p. 203). Thacker continues this observation and takes it one step further as he argues that within the new digitally framed biology science, not only has the border been made porous, but it has in fact collapsed into one and the same leveled dimension of biomedica. This is much due to biology's accelerating dependency on and use of computer technology (Thacker, 2004, pp. 39–40). Thacker analyzes the example of “information” that has been a metaphor for DNA since the 1950s, and argues that information no longer can be called a metaphor for DNA, but instead must be viewed as an inherent part of DNA as a technical principle (2004, p. 40). The relation between information and DNA, for example, has thus been transitioned “from metaphORIZATION to automatization” (Thacker, 2004, p. 40), in a process where no external appropriation of metaphors is needed anymore. Thus, biomedica is a step away from the classical sense of a metaphor where it is described as “a figure of speech in which a word or phrase is applied to an object or action to which it is not literally applicable” (Oxford Dictionaries).

It's not hard to find support for a biomedica collapse of the metaphor in contemporary biological research. As an example, a group at Zurich's Department of Chemistry and Applied Biosciences has recently showed that contemporary alternatives of storing data on memory sticks and hard drives are outclassed by new methods of storing data on DNA. Compared to the 50 years that data lasts on a CD, storing data in bone tissue will make it last for a million years, at least (Grass et al., 2015). Body, DNA, and information are inseparable in this example. This interlace is clearly illustrated by the image that was made by one of the researchers in the group to visually enhance the research results (Figure 4.1). In the illustration, the data digits overlap seamlessly with the genetic information within the bone piece, as if they naturally belonged to the same system of information.<sup>2</sup>

Another example of a complete merge between body, DNA, information, and technology is the recent developments of biological engineering within synthetic biology. Here a total merge between DNA code and computer code is commonly agreed upon as the base for research. On the blog *biony-fiken.se*,<sup>3</sup> Sina Armour Pour, one of the co-founders of BioNyfiken Sweden, answers a question what BioNyfiken will do in their newly built laboratory in Stockholm. He answers by referring to a TED talk by bioengineer Tal Danino where he presents his aims to develop techniques for programming bacteria with different algorithms, as is done in computer software.





**Figure 4.1 Illustration (Philipp Stössel, ETH/Zurich).** Previously published in Grass et al., 2015. Used with permission. (Philipp Stössel from Grass, R. N.; Heckel, R.; Puddu, M.; Paunescu, D.; Stark, W. J., *Angew. Chem.-Int. Edit.* 2015, 54 (8), 2552–2555. Reprinted with Permission.)

The desired outcome of Danino's project is to program these bacteria to detect and treat diseases like cancer. The example clearly shows a transition from metaphorization to automatization that it shares with a lot of contemporary research within synthetic biology, genetic engineering, and biomedicine. In Danino's example, bacteria will not only be understood as digital devices, they will also be treated practically as digital tools with different functions that are determined by the programmers' individual intentions. Armour Pour answers that this is the kind of research BioNyfiken wants to engage in. This proves how the collapse of the metaphor is also of high importance to the Swedish biohacking movement. Another post on the *bionyfiken.se* blog (April 25, 2015), in which Armour Pour reflects upon an article on biohacking that had been published the previous day, confirms that the collapse of metaphor is important to BioNyfiken's approach to bio-research. In the article, published in Sweden's largest daily newspaper *Dagens Nyheter*, the journalist explains the methods of a biohacker by comparing them to the methods of a computer hacker, someone who "rebuilds, experiments, and creates new within computer technics. The biohacker wants to do the same, but with organic material instead of PCBs and code" (Larsson, 2015). Armour Pour reacts to this by explaining that biohackers who work with bacteria and DNA instead "use DNA and bacterias as computer hackers use computers, PCBs, and code. That's where we are heading. A future where we use organic machines *as* computers and PCBs and where we write code with DNA."<sup>4</sup> The journalist uses a metaphorical explanation where the biohacker is supposed to do something to the organic material with inspiration from a model coming from outside of the biological field. In Armour Pour's answer, this metaphor is

collapsed and computer and body are made equivalent to each other in an amalgamated “organic machine” actually consisting of PCBs and code.

Now it is time to look at the relations that surfaced in the interviews in comparison to Ihde’s four technology relations, in order to find how to methodologically proceed from here. First, let me briefly sketch Ihde’s human-technology relationships (2015) to assure my departing points:

1. *Embodied relation*—Ihde’s classical example is looking through a pair of glasses. Even if the glasses are not explicitly noticed all the time, it co-shapes our relation, engagement, and interactions with our surrounding world.
2. *Alterity relation*—In this relation we treat our technology at hand as if it was a living creature separated from us.
3. *Hermeneutic relation*—Ihde’s classic example to exemplify this relation is the thermometer that we have to “read” and interpret in order to turn into a perception. We will not actually experience heat or cold, but the interpretation of what the thermometer displays will give us a representation of reality that we can translate into our own bodily sensation of temperature.
4. *Background relations*—in this relation the technology makes up the background of our experience, and creates a context for our perceptions.  
After interviewing the biohacker informants, the material retrieved

showed that the human-technology relation that was dominating among the biohackers was most equal to the embodied relation. The seamless blending of the biological body and the computer system within the movement shows affinity with Ihde’s example with the glasses that grow onto the bearer and become an unconscious extension of the biological body. The transparent way in which it shapes the world- and life-experience of the glass bearer is also obvious in the biohacker example as ideas about the computer system leak onto the conceptualization of the human biological body, and also shape the actions taken to manipulate, optimize, or control it. But the blending of body and technology is not in itself an object for reflection among the biohackers. The border between

biological body and computer system in the biohacker environment has imploded in such a way that it avoids reflection and conscious meditation. Just as with all of Ihde's relations, the embodied relation in Ihde's scheme is dependent on intentionality; and the relation between the glass bearer and the glasses never frees the glasses from being a tool used by the human individual in order to enhance reality. Our intentionality to engage with the world is mediated through the tools. Thus, there is always a possibility to take the glasses off and stop the enhancement. The human relation to technology as a tool cannot be entirely unconscious, except, perhaps, for short time periods. Moreover, I'm sure the level to which "transparent" embodiment of technological artifacts is possible is a strictly individual matter. The amount of factors that impact how prone a certain individual is to reaching successful transparent embodiment is probably vast, and is—though it is not within the scope of this text—an interesting and much needed field for future postphenomenologists to map. In summary, within the biohacking community, both intentionality and relation have been reduced to a minimum, as the tool dimension—to a large extent—has been eradicated.

To make this a bit clearer we can compare it to the relation I found present among the self-hacker informants. Though the rhetorics on a network level seemed to show a parallel implosion of metaphor present both within the biohacking community and the self-hacking community (optimizing and controlling the biological body as a computer), interviews laid bare that different kind of technology relations dominated the two groups. From the interviews with the self-hacker informants, it was also hard to distinguish between the informants' relations to their technological equipment and their relations to their own biological bodies. The equipment they used to monitor biodata was perceived of as displays making the data—already present within the body—visible. Just as in the example with the USB-bone piece (Figure 4.1; Grass et al., 2015), the data code of the technological equipment and the biological data were seamlessly blending into another, and flowing from body to device without friction. The body was further understood as a computer system consisting of data and information that was partly controllable but also unpredictable in its network structure. The informants' approaches to their own biological bodies made me think of the rhizomatic network described by Deleuze and Guattari (1980/1987). One of the informants expressed how he experienced how this partial feeling of control made him insecure, and that this came from ideas of the body working as an open-ended web or network. He explained his fears that the disruption or manipulation of one node of the network within the system may cause changes (often long-term) that would eventually lead to illness and instability of the system. This comprehension of the biological body shows affinity with a

rhizomatic network model that is decentralized and unpredictable; and one that finds new ways of transferring information even if it has been manipulated in order not to (introduction; Deleuze & Guattari, 1980/1987). Moreover, among the self-hackers, I found something that resembled a hermeneutic relation, where the informants reported they were interpreting the signs of the body parallel to the information that their technological devices visually displayed. One informant also reported how her technological devices led her to questioning if her experience of her own body was, in fact, correct. For instance, she reported how the devices made her think and react in ways like, “My blood pressure has risen—I must be feeling bad.” The technological devices thus led her to feel bodily sensations she would not have felt if she hadn’t been able to interpret information on the displays. She reported this as “anxiety rising.” The hermeneutic relation, in this case, thus led to something that can be compared to Ihde’s alterity relation. I have elsewhere related the alterity relation to Sigmund Freud’s concept of the uncanny, as feelings of quasi-otherness and experiences of the uncanny, in my opinion, share a profound likeness (Goysdotter, 2013). The experience of the body turning into someone to which I necessarily relate but don’t really trust shows signs of a failed embodiment relation. The embodiment process has then stopped halfway and, due to different factors, avoided implosion. This could be compared to the relation found among the biohackers where the separation between body and technology found within the self-hacker movement has been overbuilt and no glitch to reflect or hesitate in front of it is present. If the self-hackers could be placed closer to the hermeneutic/ alterity relation not reaching the embodiment relation, the biohackers have transgressed the embodiment relation and instead moved toward a collapse of the relation.

Recent postphenomenological studies have dealt with contexts of new technology where Ihde’s four human-technology relations have been somewhat twisted toward what Peter-Paul Veerbeek and Robert Rosenberger call a “fusion relation” (Verbeek & Rosenberger, 2015, p. 21). In these relations, found, for example, in cochlear implants or artificial heart valves, the relation is more intimate than that active in the embodiment relation (p. 21). I suggest that the collapse of the metaphor rather suggests that the relation between human biological body and technology within biohacking has imploded into a *non-relation*. It seems to me as if a belief in that the body actually *is* a computer could hardly be called a human-technology relation anymore. For what is a relation, in a phenomenological understanding, if there is no conscious distance between the components? The non-relation is closely knit to Ihde’s theory on the interlaced body one and body two (2002). According to Ihde, body one is the perceiving, active, here-located, bodily experience developed by Maurice Merleau-Ponty as

the *corpus vécu*. Body two is the cultural or socially constructed body, discussed by Michel Foucault, for example (Ihde, 2002, p. 69ff.). It seems as if the biomedica collapse of technology into the human body produces a body concept that is neither possible to explain by body one *nor* by body two. Both the concept of body one and of body two are depending on a relation to the surrounding world —either as a world of things to perceive as is the case of body one, or as a world of social constructions as in body two. The body concept that surfaces through the collapsed metaphor, I will suggest we call *body zero*. This body is not a perceiving or a relating body, but a body which it is possible to do things to and engage practically with. Body zero is of course interlaced with body one and two, and every human contains all of them. But, I suggest, body zero could be studied on its own in order to reveal, for example, the hacker approach to the human biological system found within biohacking. In the next paragraph I will develop this idea further.

>>Rest of the text is excluded from this excerpt due to copyrights.<<

## NOTES

1. With the same aim, I have also made deep interviews with two members of the quantified self-movement.
2. The image was published together with the article (Grass et al., 2015).
3. <http://bionyfiken.se/>
4. All translations from Swedish are my own. Italics are my emphasis.
5. “Biopunk” is an umbrella term for many different sorts of biohackers with different foci. A biohacker is thus a biopunk, but a biopunk is not necessarily a biohacker.

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