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Beyond the Cyborg: Performance, attunement and autonomous computation

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Abstract

Body technologies, such as prostheses and biosensors, are active means of lived experimentation: they enable forms of hybrid embodiment such as the cyborg, whose diverse representations by artists and performers have infiltrated our societal normative regime. To talk about body politics is therefore to talk about the technologies the body incorporates, how they probe its alleged integrity. Performance theories and practices offer a fertile ground of experimentation with this issue. Yet, there is a tendency to frame body technologies as either material extensions of one's body or external objects one perceives with. Such approaches support technocratic systems of beliefs by eliding immaterial and pre-conscious aspects of technological incorporation, I argue. Key to this argument is the notion of automaticity; a subjective form of psychic attunement with particular technical instruments. The performativity of certain bodily thresholds enables forms of human-machine codependence, where body and technology affect each other through discipline, training and relational economies of desire. As a case study, I offer an autoethnographic analysis of my own performance with an artificially intelligent body technology. This reveals an inherently hybrid and relational corporeality, which confounds the boundaries between human and technical, material and immaterial, perceptual and psychological, conscious and pre-conscious.

KEYWORDS:

Cyborg; performance; hybridity; affect; computation

Introduction

This essay analyses the lived experience of cyborg bodies in performance. Its focus is on forms of corporeality involving the intimate configuration of human body and technology, with a particular attention to computational body technology. Corporeality is a concept rooted in the work of Mauss (1936) and Merleau-Ponty (1962) which refers to the physiological, phenomenological and cultural basis of embodied practices. The recent advance in real-time computation and low cost bodily sensing affords the creation of new forms of body-worn technologies, which can, for instance, autonomously reconfigure themselves during a performance in response to a performer's biological signals. Which kinds of corporealities does the staging of such body technologies produce? To answer this challenging question it is crucial to discard the very idea of bodily *extension* (a thing which extends out of the body) and focus on the notion of bodily *incorporation* (multiple things which unite into one body). To grasp this idea of incorporation, I argue, it is useful to understand performance art with technology as a site where to *inhabit* hybrid forms of human-machine embodiment.

After Haraway (1985) and Shilling (2005), I refer to hybrid forms of human-machine embodiments as 'technological bodies'. These are amalgams of technology and flesh where a particular body incorporates a particular instrument, rather than pairing with it as if they were two unbiased separate entities (Shildrick 2013). Hybridity has to do with the displacement of societal and institutional normative definitions of the body, which historically reject hybrids and consider them monstrous (Shildrick 2002). How can technologically mediated bodies in performance contribute to uproot such normative definitions? Performance research counts many varied contributions tackling this problem, such as the works by Parker-Starbuck (2011), Bissell (2013) and Klich (2012), among others. This essay joins their efforts by focusing on the generative potential of radical embodied experimentation. In my view, the notion of 'inhabiting' a technological body is key. By directly experiencing staged forms of hybrid embodiment both performers and audiences gain a corporeal knowledge of alternative embodiments. They are marked by it and, in some cases, they may nurture it in their daily lives.

With 'body technologies,' this text refers to instruments which are incorporated by the body; that is, combined with it in ways which entail intimate and mutual influence. In this view, body technologies may include physical objects, such as particular mechanical instruments, musical instruments and medical prostheses, as well as computational systems, including wearable hardware and artificially intelligent software.² My interest lies in disavowing the idea that body technologies are either material appendages augmenting the body or objects of epistemic significance enhancing one's own knowledge. Rather, I

want to stress the importance to acknowledge the complexities of living and performing hybridity through the incorporation of technology. For the corporeal knowledge emerging from such experience can help us grasp hybridity and manifest its potential as a resilient method of critical action. My viewpoint is twofold for I am a scholar as well as a performance practitioner. It is a little more than 12 years that I perform with my own body and the bodies of others, researching and implementing wearable biophysical technologies and staging various forms of what *could* be called cyborg performance. I tend not to define my own artistic work as such, however, for the commonplace understanding of cyborg bears slippery features which are far from my aesthetics. More simply, and perhaps not too precisely, I address my work as performances of bodies and machines.

The concept of cyborg - possibly one of the most common figuration of human-machine embodiments - defies static and universal definitions. From its roots in cybernetics and space travel (Clynes and Kline, 1960) it has evolved into a significant cultural components of society, with dedicated sets of studies spanning across cyberpunk culture (Featherstone and Burrows, 1995), feminist philosophy (Haraway, 1985), gender studies (Balsamo, 2000), media theory (Zylinska, 2002) as well as performance research (Parker-Starbuck, 2011). In the past few years, various kinds of cyborg incarnations in popular culture have ambiguously popularised and drastically softened the figure of the cyborg. Emerged from a localised subculture to symbolise, envision and discuss radical embodiments, the cyborg is now heralded in popular culture as the emblem of a tired male-dominated technocratic narrative of oversexualised super-human machines and techno-glamorous human enhancements. This essay is not about the history of the cyborg, its technical possibilities or its popularised incarnations, but rather about what lies beyond the very notion of cyborg. My proposal, which I discuss in the following, starts from the premise that human-machine embodiments are forms of co-dependence rather than pairing of two different things. I argue that human and technological actors can unite into an *ecology* of physiological, experiential, psychological and technical components; a form of hybrid corporeality where experience, psyche, materiality and technics are always in tension against each other. In my view, through discipline, training and economy of desires, human and technological actors produce embodied ways of knowing which are intimately linked to performative and relational practices, what Henriques (2011) calls corporeal knowing.

The remainder of this essay is structured as follows. First, I argue that the incorporation of technology is not a fixed condition of the physical body but a complex ongoing process involving, *at once*, physiology, psyche, cognition and unconscious. Key to this argument is the notion of automaticity, a subjective form of psychic attunement, or entrainment, with particular body technology. I use an ethnographic method to discuss forms of automaticity

in jazz improvisation and experimental psychology. The particular performativity of these two practices point, each on its own terms, to the same insight: through training in threshold conditions, body technology can be perceived as extra personal, something which is other than the subject and yet an integral part of it. The boundaries of bodily and technical, conscious and unconscious, cognition and perception, material and immaterial become thus confused. To deploy these observations in the field of performance art with technology, I turn to the experience of living an artificially intelligent body technology in one of my own performances entitled *Corpus Nil* (2016). A slight shift to an autoethnographic method allows me to describe modes of corporeal engagement which enable the machine and myself to incorporate each other. In this human-machine *configuration*, as I call it, the body is physically, psychically and cognitively reorganised through thresholds of movement, sound and vibration. Gathering the resources elaborated thus far, I bring the essay to a close by further elaborating on the link between automaticity and technologically mediated performance and on how this allows us to shatter the assumption of a purely human corporeality.

Automaticity and thresholds

As a starting point, I want to offer my own reading of Maurice Merleau-Ponty's ideas on human-instrument relationship. Merleau-Ponty (1962: 143) exemplified the working of the body's motor skills observing the case of a particular instrument, a blind person's stick. For Merleau-Ponty, the stick is not an external object to the person who carries it. Rather, to the blind person the stick is a physical augmentation of touch. The stick becomes an additional source of information on the position of the limbs, and thus, with continuous training, it is integrated in the body schemata, the motor control programmes that govern posture, movement and the use of instruments. Thus, the stick is converted into a sensitive part of the body which complements the proprioceptive sense. Turning to a more explicitly performative practice, Merleau-Ponty (1962: 145–146) observed musical instruments. In his view, when an organist rehearses a performance with an organ she is not familiar with, she does not commit to memory the objective position of pedals, pulls and stops. Rather, she incorporates the way in which given articulations of pedals, pulls and stops let her achieve given musical or emotional values. Her gestures draw 'affective vectors' (Merleau-Ponty 1962: 146) mediating the expressiveness of the organ through her body. Thus, the way a player interacts with an instrument is a response to the musical or emotional significance that given parts of the instrument allow for. The organist does not perform in an objective space but in an affective one. Player and instrument are dependent on each other, not only at a material or epistemic level as in the case of the stick, but at an affective one as well. Here the notion of instrument as either a material extension or an appendage yielding epistemic significance begins to shake.

In his ethnographic study of jazz improvisation, Berliner (1994) uses first-person interviews to show how improvisers are well aware of the importance of handling bodily automatism through repeated interaction with their own particular instruments.¹ Students have to learn that a successful performance depends in equal part on intentional control, unintentional actions and instrument qualities and affordances. Berliner (1994: 190) describes how, early on in their training, jazz students learn that ‘the body engages itself directly in the composition of new phrases’. For example, to achieve physical relief from prolonged playing, one’s own fingers may create variations on a previously trained phrase. As a result, the pianist gain new musical ideas. Importantly, this level of automatism is achieved through the repeated training of phrases requiring a certain threshold of intense physical effort (Berliner, 1994: 208). In other words, automatic variations on a formerly mastered finger pattern often happen in combination with a ‘limit’ situation, a threshold condition. For instance, increasing effort and fatigue due to a long ostinato prompt the body schemata to automatically adjust the performer’s interaction with the instrument. As a consequence, a player may find herself unintentionally playing a given phrase in a different way. One may understand this mechanism as producing an incorrect interpretation or an error. In a sense, it is a kind of glitch that happens because the body shifts between different schemata to negotiate a novel interaction with the instrument. Berliner’s interviewees however, admit on several occasions that these forms of automatism inspire them musical ideas which they could have not imagined before. What emerges here is a mutable relation of influence between a particular instrument’s capabilities and a certain body’s skills. Through a mediation of thresholds - physical, auditive and material - the body and the instrument renew their configuration spontaneously and, in so doing, produce new forms of expression. The instrument here is not only a material object or an epistemic tool. It is an actor whose specific material and sonic qualities guide, and sometimes force, the body to learn new body schemata and imagine different modes of expression. Rather than having a dualistic relation, body and instrument mutually and actively influence each other, creating thus shifting modalities of embodiment.

The threshold, a particular intensity which must be exceeded for a certain reaction, phenomenon or process to occur, is crucial here. Although it is often analysed or dismissed as a matter of physiology and perception, the notion of threshold has a more nuanced depth. It reaches aspects of bodily performativity, such as the relation between training and entrainment, which are often discarded as irrational in some branches of social sciences or purely physiological in a large part of life sciences. I follow Henriques (2010: 67) in his view that entrainment - that is, the capacity of a body to synchronise its own circadian rhythms, heartbeats and electrical potentials with the pulsation of another human or non-human

actor – far from being solely irrational or physiological, can be induced through affective intensities produced by means of sound or movement. I will come back to entrainment in the autoethnographic discussion of my own performance with an artificial intelligent computational system. For now, I want to further unpack the notion of threshold phenomena. As Blackman (2014) notes, threshold phenomena were originally examined through a deep, systematic and personal involvement of the researcher. Scientific research on this topic relied on iterative forms of embodied practice involving training, discipline and a specific kind of technical framing. Blackman refers to the work of Solomons and Stein (1896), two students at William James’ psychological laboratory at Harvard.² Their research - which provided the foundations of Stein’s well known work on automatic writing - investigated hysteria as an expression of automaticity; that is ‘the feeling of being moved or directed by [...] an extra-personal force or entity’ (Blackman 2014: 3). Among several automatism experiments, Solomon and Stein recreated in their laboratory the experience of automatic writing, a practice studied in psychic research to communicate with spirits. Automatic writing is performed using a particular instrument known as writing planchette, which consists of a glass plate rolling on metal balls and embedded with a pencil. With the arm attached to the planchette, the experimenter engages in an activity that holds her attention, such as reading a novel or listening to music or sounds. If she becomes enough immersed in the activity at hand, the arm attached to the planchette may move without the subject being aware of it. However, as soon as the subject does become aware of the movement this is experienced as extra personal, as something other than the subject. This is not an immediate result but a performative process. As Solomons and Stein (1896) described, they *learned* to perform automatic writing by conducting an intense training involving choreography, self-discipline and particular thresholds of sound, labour and attention.

It is not difficult to draw a parallel between Solomon and Stein’s experience of automatic writing and the jazz students’ experiences of automatic musical variations discussed earlier. Both practices are characterised and enabled by intense training, heightened attention and a feeling of ‘becoming unconscious’ (Solomons and Stein 1896: 499). While many performers, myself included, may intuitively understand the meaning of ‘becoming unconscious’, an analytical definition of this notion may seem a little counter-intuitive. Becoming unconscious is a form of entrainment; a trance, as it were, arising from an intimate relation between a particular technical instrument (a planchette or a trumpet) and a performative subject (a medium or a musician). Far from being exclusively material, cognitive or irrational, the entrainment that characterises experiences of automaticity is the expression of a willing unconsciousness. Corporeal self-discipline, trained psyche and systematic experimentation engage with one another to bring the body and the instrument

into a mode of unconsciousness which yields creative potential. One's own will organises the technical framing and the rhythm of training. The unconscious lets the body and the instrument move in unison. Will and unconsciousness are not exclusive but work together, iteratively influencing each other while mediating an instrument's particular affordances and qualities.

The insight provided by the study of automaticity can be readily applied to human-machine embodiments in performance. The notion of psychic attunement between body and instrument prevents artificial separations of the technological body from its lived experience. It opposes the idea of the cyborg as a self-regulating and self-enclosed human body coupled with an unbiased and neutral extension. Normative dichotomies - body/extension, real/prosthetic, cognitive/corporeal, material/immaterial - become thus undefendable. The focus of attention can then shift from result to process, from separateness to relationality, from integrity to hybridity. On one hand, it is possible to provide specific phenomenological and physiological explanations for the kinaesthetic experience of automaticity, as I did earlier in the case of jazz improvisers. On the other, the immaterial, relational and performative nature of those experiences - the way in which they emerge through training in threshold conditions and draw on subjective forms of psychic attunement - exceeds phenomenological and physiological explanations. This calls for an understanding of body-technology relationships as personal, mutable, contextualised, and technically specified. Crucially, these kinds of relationships are explicable only through their performance. By performing the tension between body and machine, human and non-human, material and immaterial, one can inhabit alternative forms of embodiment. The jazz improviser let her body 'give' previously unknown musical phrases; the medium (or writer) let her body 'speak' words that could not be otherwise imagined. This reveals a particular creative potential which the technological body yields. A potential which interested artists, performers and researchers can tap into. So, how is it for a performer to incorporate a computational system?

Learning to be affected

Computational systems - assemblages of sensors, software, cables and circuits - differ from more conventional instruments, such as a trumpet or a planchette, in many obvious ways. Yet one of their unique features is that they can learn (through data pattern analysis) and self-reorganise (by dynamically activating specific parts of their code). Here I discuss how my performer's body incorporate one such system, and how automaticity and entrainment enter, and emerge from, this process. While an autoethnographic method does not provide a universally valid view, drawing on my particular artistic work affords detailed reflection

from which more general implications can be abstracted.³ The artwork in question, entitled *Corpus Nil*, is a 20-minute body performance for solo performer, biophysical technologies, surround sound and light. The work is presented in a black box theatre where spectators are seated in front of the stage and an octophonic audio system surrounds them. The piece is based on a slow choreography of muscular contraction and limb torsions. Through these movements, the body morphs into a piece of flesh to which the audience can hardly attribute human features. Here, I purposely use the term ‘morph’ to describe the series of bodily changes as a slow, smooth and gradual transformation. Rather than demanding a fixed series of movements, the choreography indicates five key bodily postures which I can adopt by performing a diverse range of movements.⁴



Figure 1. *Corpus Nil*, still from live performance, February 2016. Photo: Courtesy of Onuk Fotografie.

The computational system I perform with consists of a set of hardware and software. Two wearable biosensors are fastened round my upper arms and connected to a computer placed off stage. The biosensors capture and transmit the sound of the muscles as they vibrate and the electrical discharge of the muscular tissues.⁵ By analysing salient feature of the muscle signals, a custom software gather information on particular aspects of movement (see Donnarumma, 2016 for a detailed technical description). Information on the abruptness, intensity and pace of the body’s actions allows the computer to create electronic sounds and patterned light in response to the choreography. Music is however created in an unconventional way. Generally, a computational instrument would be

programmed to play back a predetermined score, trigger sound samples in response to a particular event or directly map a certain aspect of movement to a musical parameter. The computational system used in *Corpus Nil* instead listens to the sounds produced by the performer's body and then re-synthesises those sounds using a bank of 20 synthesisers. Importantly, the operations of the system I described thus far are autonomous. Here, I use the term autonomous as it is intended in computing, meaning that an autonomous computational system can self-manage its resources and adapt to unpredictable changes. This, obviously, does not mean that the computational system possesses a form of subjectivity or desire. In the particular case of *Corpus Nil*, the system is autonomous in the sense that it learns aspects of the performer's movement, and then, without human intervention, selects which sound and light compositions to perform, as well as how to generate variations in response to the changes of the performer's movement. In other words, the system is not programmed to execute specific actions, but rather to exhibit an emergent behaviour which relates - but is not driven by - the performer's movement. Its behaviour changes throughout the performance as well as across different iterations of the same piece in response to aspects of the performer's muscular activity.

The sound and light composition the system produces are thus generative responses to my movements. The way I move to adopt a given posture, in turn, depends on the kind of sound and light patterns the algorithms produce. I return to this later, especially in regard to the mutual reorganisation of the computational system and the performer's body. For now it is useful to think of this process as a mutual and unstable engagement, rather than a cybernetic feedback of self-regulation. My interest in designing this type of body technology is to experience a particular kind of technical incorporation; to embody, as it were, the practice of experimentation which this article argues for. Being unaware of exactly how the instrument will respond to my movement or which aspects of movement it will respond to, means that I have to learn how to relate to the computational system. This relation, or configuration, has to be established by listening to the audible sounds, haptic vibrations of the stage floor and light patterns it produces.

Similarly to jazz improvisation and automatic writing, this kind of performance requires to train with and through the instrument so as to experience some of the particular psychic, corporeal and cognitive thresholds which may occur in a public performance. Unlike traditional musical instruments and planchettes however, the computational instrument can exhibit an evolving behaviour. Whereas I cannot learn all the possible behaviours which the computational system may exhibit, I can, using statistical algorithms, train the system to learn particular tensions, pressures and contractions of my body. By doing so I do not only train the software algorithms or solely discipline my material body. I also train my

psychological and phenomenal body to reach, together with the instrument, particular thresholds of sound and vibration. This kind of training is a form of hybrid becoming. It is an iterative process of corporeal changes through which the body re-structures itself. And the technical framing is a constituent part of the process.⁶ Despret (2004) coined a particularly apt way of describing the process through which forms of hybrid becoming can emerge: *learning to be affected*. Essentially, this means to surpass certain material, perceptual, psychological and cognitive mechanisms so as to let others - human and non-human - affect one's own body. By learning to be affected, Despret observes, one also learns how to affect others differently. Relationality becomes key. The warm cocoon of human integrity is not broken by transgressing certain limits of the body, but rather by accepting the possibility of mutual affection between oneself and something 'other'.

The notion of learning to be affected makes it possible to unpack further aspects of *Corpus Nil*. Because the body is hardwired to the machine and trained to perform through it, the body's muscular activity becomes a connective material. By means of this connection the body and the instrument can enter a dialogue. But crucially, their dialogue does not stop at the level of physiology. It takes place at a phenomenological level, through thresholds of sound and vibration that affect potential movements, latent psychic states and possible programmatic changes in the choreography. In this process of becoming, the body becomes one with the instrument. This does not mean they disappear into each other. Rather, they form a body which can be observed and experienced as a whole, while each part - human and technical - retains its particular features and capacities to affect. This is what I call a human-machine configuration: a hybrid body, an arrangement of human and technological parts where the human body learns how to affect the instrument and be affected by it.

In *Corpus Nil*, a direct corporeal engagement between body and technology emerges; a form of incorporation unfolding through the rhythm of sound, vibration and light. This affords the exploration of the expressive capacity of the body through the computational system, and vice versa, the exploration of the expressive capacity of the computational system through the body. Crucially, in this process of incorporation the performer does not lose her own subjectivity; *I* remain a particular being with particular desires. On the other hand, the computational system does not gain a subjectivity, of course; *it* remains a technological device I programmed beforehand. The distinction between *I* and *it* does not, however, preclude the configuration of the performer and the computational system into a hybrid body. They co-produce an alternative, hybrid form of corporeality which does not erase human subjectivity and does not discard computational agency, but extend them into other affective domains. This offers an extended understanding of the human-instrument

relation described earlier through the work of Merleau-Ponty. Whereas Merleau-Ponty observations on the performativity of affective vectors can hold true in the case of an artificial intelligent computational system, it becomes difficult to distinguish who is the subject or the object of the action. In this case, the capacity to affect and be affected does not reside only in the human, but also in the computational system, for it contributes to the performance in ways which are not fully pre-determined but rather emerge from the dynamic interactions between the human and the technical. The problem then is not who is the subject or the object, but how an ecology of physiological, psychological, cognitive, material and technical forces create hybrid forms of corporeal knowing.

A description of the experience of the performance can help us elaborate this further.² In the following, I will describe the particular interactions of my own body and the computational system to illustrate how the two perform through each other, forming a technological body. At the beginning of the performance, the theatre is completely blacked out. I lie on the stage in a foetal position. A custom built LED light is placed on the floor facing the body. My whole head and most of the arms are painted in black so that the only body parts the audience can see are back, shoulders, chest, sensors and cables. In the beginning of the choreography, the knees are on the floor and the torso is completely bent forward to touch the floor. I balance the weight of the body by pushing the knees against the stage floor and perform subtle movements with the shoulders. Algorithms begin to sonify the sound produced by the muscle contractions using a few digital synthesisers. The music is gentle and barely audible. The movements grow in intensity and spatial extension until I shift the body balance onto the neck and slowly lift my back up. As the movements intensify the timbric texture of the sonification becomes more dense. The music becomes increasingly more present; by pulsating rhythmically it materially resonates the space, and thus I begin entering a state of entrainment.

At this point, I use the head to press firmly against the stage floor and thus lift my back completely up. The back is held vertically to allow the audience to see it fully; my arms are crossed behind the back while the hands hold the feet. By this time my concentration level is high. The muscular tension I have to exert to hold the body in this position is intense and the sound and light submerge me. I breathe. The breathing is very deep so that my back excessively swells up every time I inhale. This also causes my consciousness to drop a little, as breath deeply and oscillate the body back and forth, I enter again a trance-like state. Here, all 20 synthesisers are active and the result is a rich drone composed of several sonic layers. Audio resonances occur naturally due to the overlapping of certain sound frequencies produced by the synthesisers. After two minutes, the algorithms respond to the lack of variation in the muscles activity by muting the synthesisers and outputting, in a

slow crescendo, the audio feedback accumulated until this point. This forces me to come back to myself. Consciousness drops in again and I take the algorithms response as a cue to start performing the second part of the choreography. I begin moving the shoulders again, but this time the movements are frantic. To the audience, it may look like something within the piece of flesh on stage is pushing against the skin to break free. After about a minute, I let one of my arms break free and fall onto the floor. I fully extend the arm outward, then try to lift my elbow several times by pushing the palm of my hand against the floor. The motion is irregular, in a similar way to that of a newborn horse trying to lift his legs for the first time. I perform similar gestures with the other arm and then enter the final position of the choreography.



Figure 2. *Corpus Nil*, still from live performance, February 2016. The body crawls towards the light. Photo: Courtesy of ONUK Fotografie.

Here, I hold the neck and hand palms against the floor, sustaining the body weight. The feedback crescendo stops, the light intensity increases so I stay still in this position and count about 30 seconds. The algorithm take again the cue from the muscles inactivity to mute the feedback sound and play back the direct sound of muscle contractions. As I move the arms and neck forward as if they were three legs, the deep low frequency sound of the muscle is clearly audible through the subwoofer, as well as tangibly perceivable in the upper chest. The sound is amplified to be deep and loud enough to resonate the stage floor, the audience's seats, the whole theatre and the performing body on stage. As I focus on the low frequency sounds inundating the ears and resonating the internal organs, I progressively

move towards the light in front of me, in a similar way to which certain moths are attracted by the light of a lamp.⁸ As I get closer to the light, the sound volume increases and, as I almost touch the light by contorting the neck and shoulders, the sound stops and the light goes off. For about 40 seconds the theatre is in complete darkness, the performance is ended.

As this description suggests, the piece is purposefully designed to strain and constrain my capacity of movement. To produce the movements described above I have to carefully balance the muscle tension throughout the body and repeatedly shift balance onto different body parts. The biomechanical constraints of the human body are understood here not as a limitation but rather as a space of play which makes possible the reorganisation of the body parts. With 'reorganisation' I mean that the parts of the body literally change function. The neck takes up the function of a leg and supports the whole body on the floor. The arms become two legs, which allow the body to move forward. The back turns into a chest, it breathes and hold the limbs together. What enables the body to reorganise its parts is its particular configuration with the instrument and the context. The body's position on the stage floor changes according to the musical and aesthetic goals of the piece, and it is influenced by both the audible sounds produced by the instrument and the acoustic resonance of the stage floor - which the body perceives as a tangible vibration on the skin. As the body parts shift to a different position and acquire a new function, another kind of reorganisation takes place: the reorganisation of the instrument's algorithms. As the muscle signals inform the algorithms of the changes occurring in the performer's body, the instrument reorganises itself; it may mute or enable a given set of algorithms and re-arrange the array of mappings that link the muscle biosignal features to the sonification modules. As a result, the instrument responds to the performer with a range of vibrational, auditive and visual stimuli which, in turn, influence the way in which the body is reorganised in a variable, dynamic feedback loop. This kind of reorganisation process is twofold, for it happens at once in the human body and the instrument. Through their configuration, performer and instrument do not only influence each other, but progressively condition the rearrangement of their respective parts, forming thus an unfinished technological body.

Conclusions: How can performance speak back?

The way in which the human body and the technological instrument are used in *Corpus Nil* constructs an alternative form of embodiment. It is an alternative embodiment in the sense that it does not resemble any other body in particular, but rather configures, through sensors, sound and light, the human and the technological parts into a different kind of

body. As the body moves, the physical articulation of the limbs, the subsequent responses of the algorithms and the affective forces I experience are learned by the hybrid body not as a mere bodily mechanism, but as a specific motor programme, a body schema that yields a given expressive and affective value. However, this way of learning is neither fully conscious, nor completely stable. As discussed earlier, this is a willing and unconscious form of incorporation. It is a process where the instrument is not perceived as an external object or a prosthesis in a conventional sense, but gradually becomes a part of the human body as an extra-personal entity. As a result, the human body is not only human any more; a new morphological imagination arises (Weiss 1999), a novel understanding of one's own body as one and multiple, fixed and changeable.

Within the precarious experience of a technological body that is mutable and relational, movement becomes a vector of affect.² I may perform, or fail to, specific body schemata, but the point is that there is no correct way of executing a particular movement. The most successful performance is the one where I am able to let movement emerge from the rhythm of sound, vibration and light produced by the machine. In other words, the way in which body schemata are performed, compromised, changed or created anew is guided by the configuration of the performer, the instrument and their context. The aim is not to perform correctly, but to reach a certain level of entrainment which enables movement to arise. As the performer's intentions are constrained, both in terms of aesthetic outcome and physical performance, an observer finds difficult to define whether the computational system is acting upon the human or vice versa. In fact, they are both acting upon each other.

The phenomena of automaticity described thus far, from jazz improvisation, to automatic writing and technologically mediated performance art, point to the affective quality of materiality. They provide a link between the materiality of human and technology and the affective potential they may release. The supposed distinction between material and immaterial, and consequently of cognitive and affective, thus vanishes. Their separation is replaced by a generative tension between what can be touched (flesh, cables, circuits, stage floor, lights, speakers) and what can be experienced (entrainment, concentration, instinctive impulses, disorientation, excitement). Through the materiality of their relation, human and computational system access new capacities to affect and be affected. This is not, of course, an obvious result of all human-machine relations. For a human being, it is a process of learning to become unconscious and to share control with the machine. For a computational system, it is about learning to sense a particular human body and to generate responses with its own means. Both the human and the technological other learn, each on its own terms, how to affect and be affected. In this hybrid ecology, human and

technical, materiality and immateriality, conscious and unconscious are equally important, none of them is central. Positing a primacy of either the material or the affective leaves little room to creatively and critically combine body and technology, in both performance theory and practice. Instead, it is possible to think of embodiment as a configuration, an ecology of relationships which enables the human and the technical to form a living, psychological and cognitive body.

The computational capacity of body technologies such as the one used in *Corpus Nil* usefully complicates the above argument. The capability to listen ‘into’ the body, learn from it and exert influence onto it speaks of hybrid forms of corporeality. Through specific configurations, these kinds of computational systems co-produce the physical, psychic and cognitive bodies they are part of. What I mean with ‘co-production’ is that the computational system contribute as much as the human being to create an alternative corporeality. To understand this, one has to recognise the extra personal forces at play in technologically-mediated performance and elsewhere. Automaticity is, once again, key here. The notion of automaticity blurs the borders between physiology and psychology, human and technical, self and other. As seen earlier, for Solomons and Stein (1896) as well as in my own performance, the phenomenon of automaticity involves becoming unconscious of certain bodily and cognitive operations being performed by one’s own body. It happens through repetition, rhythm and effort. When an automatism comes in, consciousness drops out, and

other components of intentional action, such as the feeling of effort and the experience of a motor impulse, quickly disappear with it. The dropping out of consciousness is temporary and irregular, and when one becomes aware of an automatism, this is perceived as extra-personal. It is not the jazz improvisers who plays a new musical scale, it is the fingers that ‘give it’ to the musician (Berliner, 1994). Automaticity is a ‘transitional process’ emerging and disappearing through ‘thresholds of sound, effort, repetition and sensation’ (Blackman, 2012 :47). Rather than being an unintentional or uncontrollable phenomenon, which for some scholar (Ericsson, 2006) should be avoided, automaticity is a complex entanglement of the conscious and the unconscious, the material and the immaterial. Through automaticity, a player does not simply perceive the instrument as one of its body parts, like an attachment or an external object. The instrument acts upon and can even guide the player’s body. It is perceived as an extra-personal force which pulls and pushes the player’s body inside and outside of its normal reach, and in so doing, it co-produces a hybrid corporeality. If the proposition I elaborated thus far holds true - that body technologies are not only appendages, but actors changing what a body is and feels - then the assumption of a purely human corporeality is shattered.¹⁰ In turn, it becomes possible

to talk about hybridity in terms of expression (the act of expressing something) and expressivity (the qualities of a certain expression). That which becomes hybrid is never only the physical body. The lived body, the thinking body, the gendered body, the loving and the suffering body, the entirety of what a human body *is* becomes hybrid.

Hybridity tends to be perceived as unsettling or dismissed altogether as ‘abnormal’. Indeed, the technological body in *Corpus Nil* is often perceived as disturbing by the audience. Several other artworks exploring radical hybridity, such as the immobile choreographies of Yann Marussich, the arresting rituals of Olivier de Sagazan, or the fleshly mutation of Maria Donata D’Urso are likely to provoke similar reactions.¹¹ This happens possibly because those kind of bodies do not meet the expectations of (Euro-American) human perception, do not resemble closely enough a living creature, or because their physical traits are not enough human for them to be acknowledged as such. Yet - and here lies a potential of resistance and friction with dominant system of beliefs - those unsettling bodies on stage are full of life, struggling with their few means and energies to come to life, to be individuated, to acquire a distinctive form, to be, perhaps, acknowledged as living, vivid hybrids. The audience can feel it. Does this make those disturbing bodies human enough? Or, put differently, is the common meaning of ‘human’ enough to describe them?

The questions above are clearly provocative, but hopefully serve well to convey the need to confront, boldly and loudly, the supposed integrity and self-subsistence of the human body. In my view, technologically-mediated performance must offer critical reflections on the role of technics in relation to notions of ‘normality’ and ‘hybridity’. It must create first-hand visceral experiences of other kinds of bodies, unformed, ungendered and unfamiliar. It is the current meaning of integrity and rationality which must be opposed in the first place. This does not mean to oppose normality with ‘abnormality’, rationality with irrationality, utopias with dystopias, and so on. A polarisation will not be solved by creating further opposites. Dichotomies - human/non-human, body/machine, rational/irrational - thrive on the assumption that dividing things from one’s self produces unity, certainty, satisfaction and feel of being in control. But it is not always so. By opening up, letting consciousness fade and allowing attunement to replace control, radical experimentation with technological bodies can materialise vivid and enchanting experiences of hybridity.

Notes

1. See also Sudnow’s classic work on learning piano improvisation, where he uses phenomenological insights to describe how his hands (not himself) learned to

- improvise through a progressively more intimate relationship with the piano; a know-how earned through an understanding of the unconscious aspects involved in learning and performing embodied practices.↵
2. William James was a seminal American philosopher and psychologist, acknowledged as a leader of the philosophical movement of pragmatism and of the psychological movement of functionalism.↵
 3. At a methodological level, my use of autoethnography draws on the works of Sobchack (2010) with prosthesis phenomenology and Bowers (2002) with electro-acoustic instrument design.↵
 4. A trailer of the performance lives at <http://marcodonnarumma.com/works/corpus-nil/>, while an integral recording can be found at <https://www.youtube.com/watch?v=BDcN3ku-gu8>.↵
 5. In physiology, the former is known as mechanomyogram, the latter as electromyogram. The technically inclined reader may find interesting to look at Caramiaux, Donnarumma, and Tanaka (2015) and Donnarumma (2017) for further details.↵
 6. 'Becoming' is a standard philosophical term, originating in Heraclitus' doctrine. It has been differently explored by Western philosophers including Hegel, Marx, Bergson and Whitehead, and later used in the work of Simondon, as well as Deleuze and Guattari, among others. More recently, the current of New Materialism (Van der Tuin and Dolphijn 2012) developed the notion further.↵
 7. I will describe how a performance of *Corpus Nil* generally unfolds drawing on my memories and corporeal knowledge of the experience. However, each iteration of the performance is slightly different and not all iterations would perfectly fit this description.↵
 8. This is normally at an angle, since moths read light as the moon.↵
 9. The topic of movement as affect is as fascinating as it is broad. While this text is not

the adequate site to discuss it, the interested reader may find relevant the views on this issue by philosopher Manning (2009) and scholar Portanova (2013). For related reflections in the more particular context of movement and technology see Salazar Sutil and Popat (2015).↵

10. The same holds true in the case of other living non-human entities, including animals, microorganism and plants, which actively participate in human corporeality. See the already mentioned works by Parker-Starbuck (2006) and Despret (2004), as well as Haraway (2003) on what she calls ‘companion species’ and Game (2001) on human-horse relationships.↵
11. The list could be extended much further by looking at visual arts. Francis Bacon and Paul Thek are just two notable examples among many others.↵

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