

# Beyond Ergonomics: Visions of the Body in Product Design

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## ABSTRACT

The human body, as the source for the project but also its addressee (that is, as the *place* of departure and arrival), has been understood in a variety of ways. Following one possible line of thought, the body has been – and continues to be – a metric, geometric-mathematical, anatomical, physiological, biomechanical, bionic, psychic, sensory and social *place*. Products have clear links to the human body: they are designed for its use and enjoyment, they complement or complete it, they help create ties with the physical world, they aid its social and cultural participation, and they join the body in its sphere of action. In this article, we will revise visions of the body in Design Theory and Criticism literature, but also using literature in Philosophy, Anthropology and Sociology of the Body, that is, literature relating to cultural and social considerations of the body that are less often considered in the practice of Product Design and which we believe to be essential. We intend, then, to present and discuss a multiple (malleable) model of the body to be useful for product designers.

**Keywords:** Product Design, Human Body, Philosophy, Anthropology, Sociology of the Body

## DISCUSSING THE BODY IN PRODUCT DESIGN

In the search for comfort, well-being, functionality, performance or beauty, product designers ponder the relationships between the objects they design and the human body. The body is the addressee of their objects and the source of their work. Often, designers consider the body by referring to Anatomy, Anthropometry, Ergonomics and Human Factors, and also Bionics and Biomimicry. They consider new disciplinary approaches and processes such as user-experience design and user-centred design or interaction design, pondering users' comfort, needs, experience, and limitations, as well as products' usability, universality and inclusivity. These resources prove one of Product Design's intentions: to establish close ties with the body. Nonetheless, this finding is not enough, for now, for us to be able to talk about a wider consideration and discussion of the body in Product Design disciplinary culture (in light of the variety of contemporary discussions). Design Theory and Design Criticism, which are the disciplines that underpin practice, have not been prolific in strengthening in-depth discourse on the *bodily condition* (in light of the complexity of the relationships between the body and the surrounding environment and objects); the theoretical and critical base is small, although occasionally significant. Ricard (2000) referred to man's dependence on objects and,

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consequently, a state of need. Forty (1993[1990]) identified an incompleteness of the body, which gives objects – understood as prosthetics – the role of providing it with functional, social and symbolic completeness. Bonsiepe (1992[1975]) underlined the need for *structural integration* between the body and objects (tools) in a visual, tactile way. Manzini (1992[1990], 110) saw the need to explore the (multi)sensorial in products designed as reactive surfaces. Norman (1998[1988]; 2005 [2004]) called attention to the importance of cognitive features in Product Design and, more recently, pointed towards the importance of sensory/emotional features. Branzi (1989[1985]) discovered a new centrality to the body as a vehicle for recording signs and expressions – images, objects – which contribute to building personal and group identity. Lupton (2002, 2006) reflected on objects that express and encourage reflection on the body and skin. Lupton's considerations about *the body in objects* has an opposite: faced with the radical technological devices that surround the body, at a time when the boundaries between the body and objects are becoming blurred, the body itself can be considered a *designed object*. In this respect, Bürdek (2005 [1991]), pp. 425-432) has speculated about the impact of new technologies on the body and, as a result, on Product Design. The signs of a shift from a Digital Age to a Biological Age are directed more towards the body than towards products. The impact of microelectronics on the objects of Product Design appears to be well established (miniaturisation, screens, visual and touch-based interfaces, interactivity), but we will now be facing the possibility of seeing technology migrate to the body, passing over objects. This is why Maldonado (2003) has called for ethical reflection.

Despite some contributions, discussion of the body in Product Design culture continues to be limited, scattered and therefore relatively inconsistent and unsystematised, as some authors acknowledge. Cranz (2000 [1998]), when rethinking the object *chair*, notes how the body has been neglected, and suggests considering it beyond Ergonomics, pointing towards *body-conscious design*. Evoking Walter Benjamin (1982-1940), Katz considers the need to develop a *critical theory* of the body (she was, however, writing in the context of Fashion Design rather than Product Design). We have also discussed the subject of the body before when referring to the future of artificial objects (Dias 2005), systematising some connections between body and object (Dias, 2012) – in the context of current *virtualisation* processes (Lévy 2001 [1998]) – and pointing out the need for critical consideration (Dias 2012, 2013; Dias & Ferrão, 2013, in press).

In spite of the link between human-produced objects and the body being clear, in spite of the designers considering bodily *dimensions*, and in spite of some of their objects incorporating topics (concerns, worries, passions) and contemporary images of the body, a wide, in-depth hermeneutic and criticism of the *bodily condition* appears to have been forgotten, both in theory and in project practice. Currently, actual and potential relationships between Product Design and the body do not seem to have been sufficiently intellectualised or consistently articulated. The topic of the body has, in fact, not been very common in the reflections and discourse surrounding practice, when, in comparison, it has been found to a much greater extent in discussions dealing with some frontier disciplines such as the Visual Arts and Architecture and, consequently, in each discipline's practices. As mentioned, there are considerations on the body in Product Design: the use of anthropometric data, studies on body-machine interaction, methodological processes based on users' experiences; the resulting appeal for the comfort, well-being, health, usability, universality and inclusivity of products; consideration of the prosthetic theory of objects or the concept of interfaces and interactivity; elaboration on forms, colours and materials that appeal to the senses... But a theoretical and critical discourse that is sufficiently wide, constant and systematised, with the critical mass necessary for a wide-reaching, operational contribution to the discipline's practice, has not yet been formed. And, in the same way, it is not possible to infer a sufficiently reflected contribution from the discipline to the process of the *social construction of the body* – the body, as it is dealt with in the field of Social Sciences, is a *social construction* (never a sealed, pre-defined entity). In other words, it is a *construction* moulded by society, culture, policies, institutions, disciplines, and social agents (Le Breton, 2006 [1992]; Blackman, 2008). In fact, the objects of Product Design also *construct the body*, as does the discipline, but there does not appear to have been wider reflection on this contribution and its reach. It seems to us that the body in Product Design needs to be urgently rethought, not least because practice, theory and criticism have been able to articulate a (wide and significant) discourse that could construct other *territories*, for example on the *body of the Earth* (eco-design, sustainable design) and the *social body* (Bauhaus, Hochschule für Gestaltung of Ulm...).

The process of critically reviewing the body that has been running in many fields of knowledge and action, from science to the arts, appears to be reflected only in passing in the area of Product Design. The Humanities and Social Sciences in particular have performed hermeneutic study and multi- and interdisciplinary criticism (Philosophy, Anthropology, Sociology of the Body...) that considers different levels of understanding the body, in the complexity of its relationships with the surrounding environment in its physical, technological, cultural and social forms.

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Product Design lacks sufficiently in-depth consideration, discussion and theorisation on *what the body can be*, i.e., the ways that the concept of the *body* can be considered for discussion and potential application in the discipline's practice. It lacks a systematised hermeneutic and critical approach.

The discussion summarised above arises from a recently concluded research project (Dias, 2014), which included the following fundamental research areas: i) the topic of the body in Product Design culture: forms of approach; ii) the multi- and interdisciplinary critical review of the body in the Humanities and Social Sciences, in fundamental authors from the Philosophy, Anthropology and Sociology of the Body: understandings of the body and its links to the surrounding world and to material culture, potentially useful for consideration in Product Design practice; iii) paradigmatic examples of Product Design that illustrate links between the body and objects and question understandings of the body. Using literature, interpreting objects and mapping information, the research work resulted in a hermeneutic, critical *model*, which was produced *cartographically*: as a *map-model* of understandings of the body. This article presents that *model* as an interpretative and critical mapping of *visions of the body for Product Design*.

## MAPPING THE BODY

### Flesh

*Flesh* is the primary level of interpreting the body, or rather, it is the level that does not truly constitute the *body*: it is the organism, the set of organs – biological and physiological matter – which lives and will one day die. But since life is the inability for one organ to detach from another (Maria Zambrano *apud* Tavares, 2009, p. 33), and because all that is life (whether human or non-human) is obliged to be connected (Tavares, 2009, p. 33), then there are latent connections in the organism, multiple connections. In other words, the *body* is latent. The organism has a predisposition for connections, multiple connections. And these connections are enacted through contact with others and the world. It can be said that the *body* only exists when those connections are established – in human beings, and also perhaps in other living things. Nonetheless, Man is the living being – the organism, the *flesh* – that has been able to create the most connections and the most veils for the flesh. It can be said that Man is the animal that has managed to create the most *body* – through all its connections, undertakings and constructions: social, cultural and technical – and is able to hide more flesh: its instincts and impulses.

What interest does this primary bodily layer have for product designers? Let us remember that the functioning of living organisms has always been a source of inspiration for project-based fields, through scientific, bionic, biomimetic and biomechanical studies, embodied in numerous practical applications. This source of inspiration should clearly continue to inspire designers.

Another type of possible consideration for designers is related to the *emergence of flesh*, identified by Miranda (2001) and, in short, it goes back to the ideas in the previous paragraph: the evolution of scientific studies on organic matter (at cellular, molecular, atomic level). When technological emergence makes it possible to manipulate biology (when Technology and Biology come together) *flesh emerges*. It emerges as matter that can be manipulated, as malleable material. Design and designers, and also theoretical and critical reflection, have not been alien to these possibilities. It is still a hazy area as regards Product Design (a project area that has worked with technology created during the Industrial Revolution and, more recently, the technology of the Digital Revolution). The possibility of articulation with biological technology is certainly a matter for reflection.

Also according to Miranda (2001, p. 64), another form of the *emergence of flesh* is found in day-to-day life, in the appearance of illness and bodily accidents, such as road or work accidents (other possible forms of the *emergence of flesh* are sexual desire, an impulse for violence and crime, etc.). Faced with these events, and faced with the necessary *care* of the flesh, Product Design has (and should continue to have) a preventative role, for example, in creating instruments and medical equipment and in creating safer objects, respectively.

### The Anatomical and Metrological Body

Considering the anatomy of the human body can still be a matter of *flesh*, but we prefer to set this understanding of Ergonomics In Design, Usability & Special Populations I (2022)

the body apart at this point, since it is the base of interpretation at the heart of the (metrological) *body models* most frequently used by product designers. It is a structural reading of the organism, the understanding of the organisation of organs and how they work – historically represented graphically and by physical models. It is also a measurable side to the human body, and can be articulated with techniques for obtaining individual data and statistical processing, relating to the variability of physical differences between human beings. This anatomical and metrological consideration of the body is, therefore, the starting point for studies and models of the body developed by Anthropometry and Ergonomics.

The body, understood anatomically as a source of metrological data, is a field of research that is constantly relevant to Product Design. Nonetheless, it should be noted that anthropometric models should not standardise bodies – they cannot be constituted as *universal standards*. Not excluding bodies involves an impossible *universal model*, or, conversely, considering *each body as a model*. The personalisation of products is a trend, but the serial basis of object production collides with the case-by-case approach; broad production made for each body is not yet viable. Products will have to fit several bodies, but not necessarily all bodies. What is desirable is that models are open, and that models are checked against each other, and that anthropometric and ergonomic models communicate with other understandings of the body.

## The Perceptive and Cognitive Body

Flesh (and its impulses) is linked to the psyche. Fontanille (2001, p. 235) cites the Sigmund Freud's (1856-1936) *psychic envelopes* theory, in which the envelopes serve as cases for protecting, sorting and exchanging during in the body's connections with the world and with others; they are able to receive impressions and they reveal events and psychic structures themselves. The body is proprioceptive, and can work as a surface on which to engrave. It is a place that makes the impressions it receives from the world and others subjective, it is a place for perception, cognition, consciousness and memory. And it learns and *reconstructs* the world through the senses and their inter-relationships. Summarising the theories from disciplinary fields like Psychophysics, Neurology, Psychology, Medicine or Physics, the diversity of senses is revelatory:

(i) Physiological Senses: meaning those senses that have some physiological organs or mechanisms in the body / (ii) Sensibility driven Senses: meaning those that do not have any direct physiological organs but are based on the combinational sensing of one or more physiological senses along with the past perceptions and sensibilities as also on brain functions like memory, etc. / The physiologic senses are as follows: / 1) Visual / 2) Auditory / 4) Gustatory / 5) Tactile / 6) Vestibular / 7) Kinesthesia / 8) Chemesthesia / 9) VNO – vomeronasal organ or Pheromonic / 10) Temperature / 11) Pain / 12) Haptic / 13) Space / 14) Light and Time – in terms of circadian cycles based on melatonin secretion / 15) Sensors for Parasympathetic (PNS) and Sympathetic (SNS) activation / 16) Hunger / 17) Thirst / 18) Opiates and stimulants / 19) Fatigue / 20) Sense of personal history and identity / 21) Elimination (all types) / 22) Satiety / 23) The Unifying or the psychological sense / The sensibility driven senses include: / 1) Proximity (personal space) / 2) Rhythm and synchronicity / 3) Time / 4) Intuition – as distinct from hunch (popularly known as the sixth sense) / 5) Reading Emotions and body language / 6) Immunity – especially of others / 7) Sense of economy / 8) Sense of aesthetic appeal or beauty / 9) Value Perception / 10) Humor and wit / 11) Male/Female sensibility (including Body consciousness) / 12) Sense of delight, serenity and harmony or otherwise (in persons, places and objects) (Mehta, 2003, p. 180).

As with the anatomical side of the human body, its perceptive and cognitive side is considered by Ergonomics, as well as by new disciplinary fields and processes that deal with the subjective body (users' perception, senses, needs and limitations) with the aim of increasing products' comfort, inclusivity, accessibility and usability. It is therefore not a topic foreign to Product Design culture and designers. Designing with and for the (different) senses is a profoundly challenging task – Mehta's (2003, p. 180) list demonstrates this.

## The Phenomenological Body

The phenomenological interpretation of the body considers perceptive and subjective aspects, adding to them a factor of bodily, active and transforming intentionality in regard to the things in the world. In one possible form, based on Merleau-Ponty (2000[1964], p.132), the body is connected to the world, making itself the *world* and making the world *flesh* (body as *flesh of the flesh of the world*). It is its *own body*, a *subject*, simultaneously sensing, constructed, intentional and transforming. It is now a body that is articulated with the world and with others, it is an *empirical body*, at the centre of experiences. It is a *lived body*.

Just like the perceptive and subjective body, the phenomenological topics of the body as *flesh of the flesh of the* Ergonomics In Design, Usability & Special Populations I (2022)

*world, own body, empirical body* and *lived body* do not go unnoticed by Product Design culture and designers (whether they are more or less intellectualised). These understandings refer to perceptive and sensory aspects but equally to users' needs, lifestyles and experience, abilities and limitations – which are aspects considered (but sometimes overlooked) by designers when creating products.

Another important topic to consider is the *intentional body* – the body that communicates and transforms. The predisposition and intentionality of bodies is, to a fair extent, implemented through objects. In body-object actions, the body is empowered to transform and communicate. Designers' task is to enrich this empowerment and mediation, enriching the body itself.

## The Emotive and Affective Body

An intentional body should be represented as an *emotive body* and an *affective body*. If a body is built through its connections to the world and others, and needs objects to reach them – and to *be* – it should seek to do so through affection or desire, in a process of assertion, multiplying affection, to *feel joy* (and avoid reducing itself to an organism and consciousness), to build itself as a *body that rejoices*. This is the basis of *civilisation*, as we learn from Deleuze & Parnet (2004 [1977], p. 80) and Tavares (2013, pp. 159-160).

Let us consider, then (or continue to consider) the emotive and affective body in Product Design. Designs should be made for emotions and affectivity: to multiply relationships with the world and encounters with others, for affection to circulate and multiply. In other words, to avoid sedentariness and the *restrained use* of objects, to recover the *broad gesture*, for bodily endeavours, for movement and for mobility, for comfort as the opposite of inertia and immobility, for the pleasure of differences in expression, for the sensory enrichment of objects and relationships.

## The Semiotic Body

The semiotic understanding of the body can be read as the sequence of phenomenological and affective understandings, because it again goes back to the body's openness to exchanges with the world and with others, and for its intentionality/intensity in those relationships. The intentionality of the body for communication and transformation of the world is manifested in the ability to produce objects; but these objects cannot be interpreted without a relationship with the body (Eco, 1999 [1997], pp. 351-353; Eco *apud* Fontanille, 2001, p. 235). Interpreting objects and the body itself involves a *semiotic structure*. The intentionality of the body signifies. It signifies precisely because it leaves continuations and engravings on the world: objects, impressions, representations. Fontanille (2001, p. 236) realises this signifying, intentional and transforming bodily process: an *engagement* of the body – through its signifying intentionality – and, consequently, a *disengagement* – in the continuations and inscriptions it produces.

The semiotic interpretation of the body makes it possible to understand objects (produced by hand or industrially) as continuations or extensions of the body (prostheses) but also as *inscriptions* or *negatives* of the body (on the interface surfaces): the handle of a teacup as the *negative* of the finger(s), the lip of the cup as the *negative* of the mouth, etc. We leave continuations or extensions for the section on the *prosthetic body*, discussed further ahead. As regards *inscriptions* or *negatives* on the interface surfaces, let us consider the following exercise: in any artificial object, we find *negatives* of the body; the object is rediscovered and redrawn according to the theory of negatives.

At the same time, we must also remember: i) that these *negatives* are functional and symbolic records that can/should be explored and cared for as *affordances* in receiving the body or its parts, and also to encourage joint body-object action (it should be noted that *negatives* can be combined with *positives* – relief, textures); ii) that some interfaces require a use that is as effective as possible, unequivocal, but others require broader gestures; iii) that *negatives* can contribute to the *pleasure of differences in expression* in objects (for sensory enrichment) and, as a result, to an enrichment of the relationships mediated by objects.

## The Body as an Actor

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The *body as an actor* is the body that is fully integrated into the dynamics of life in society. It is the body that is socially and culturally constructed by those dynamics, but which also builds itself in that context. It is its *own and intentional body*, which is built as identity (signifier), with others or before or for others. Bearing in mind Goffman (1993 [1959]) and Guiddens (1997 [1991]), it is a body subjected to sharing and belonging (class, ethnicity, gender, profession, etc.), but it carries behaviours, conducts, values and support for languages, symbols and objects that configure identity; it is an invested body and one that invests itself, that is forged with the aim of becoming socially expressive, seductive or influential; a body subject to rules and that breaks rules too. The *body as an actor* is, at an extreme, a body that can be designed in the *flesh* itself, when it allows expert investments in the organism (the use of implants, genetic manipulation, etc.).

The social and cultural contexts that individuals are integrated with, and their actions, are not unknown to product designers, when they ponder groups, identities and personal aspects in their work: considering social behaviour, lifestyles, social integration, personal development, personalisation, etc. Objects can be designed for individuals' social inclusion or for differentiation/personalisation (whether on a whim or not). Nonetheless, these lines of consideration often overlook the fact that the body is directly involved in individuals' construction of their identity. It is important to consider that *individuals* and *identity* are not *disembodied*, that is, they are linked with other layers of the body, specifically the *flesh* and its impulses, with the *subjective body*, with the *phenomenological body* and the *affective body*.

Another aspect to be considered has to do with the fact that the body – entangled in social rituals of communication – is built as a *support* for languages, symbols and objects. In fact, it is not just support: invested and self-invested with languages and objects (*semiotic body*), it is literally built via those processes, precisely as a *cultural body* and a *body-actor*. Therefore the body is always a *project*. The role of objects in the process of building the body is certainly important for designers to consider. By creating objects, designers also create the *body*.

We have further noted that the *body as an actor* allows expert investments in the organism itself (for example, the integration of invasive implants). In other words, the *flesh* itself can be designed – a delicate matter, which is perhaps even more relevant for designers' consideration, since this invasion/emergence of the *flesh* may have considerably different underlying motives: health, the bodies' real integration or affective endeavour or, conversely, rather frivolous reasons.

In any case, it should be considered that objects are never innocuous – the body, invested with objects, can be truly motivated and can *rejoice* but it is also a fragile thing.

## The Gestural Body

The body is a place of *techniques* (Mauss, 1974 [1934]), that is, a place of practices and acts performed through learning by the individual in society. These practices and bodily acts involve gestures. These are the gestures of the body as a social actor. They are the gestures of the *body-actor*. Crossing Mauss' *techniques of the body* with the *body-actor* we suggest considering a *gestural body* – a body of the gestures of day-to-day life, gestures for communication, gestures performed *with* objects.

In terms of the gestural side to the body, it seems important, firstly, that Product Design and designers ponder Mauss' theory of *techniques of the body* and, subsequently, that they pay attention to and deeply understand the practices, the *techniques of the body* and the *gestures* of our time to use an awareness of their complexity to rethink objects and habits – for example the sedentary habits arising from the use of personal computers or the abusive use of the object *chair*. Design strategies are needed to redefine those habits, using objects that struggle against them, that free the body for gestures, movement, mobility and fluidity.

In light of the approach to the *techniques of the body* and the *gestures* of our time, many everyday practices undertaken *with* objects can be rethought, not only to fight *bad habits* but to generally perfect the functionalities and intentionalities (performativity, expression and signification) of objects (understood as encouraging bodily action – to transform the world or to communicate).

Bearing in mind the gestural interpretation of the body, to reflect upon the bodily practices undertaken *with* objects, a distinction should be made between body-object actions that involve precision (the effective achievement of certain actions requires a large degree of accuracy when designing objects) and those that require broad gestures. In certain objects, the articulation between them should be considered.

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## The Prosthetic Body

The *prosthetic body* is the body that is truly articulated with objects in life in society. Bodily, technical and cultural gestures give objects meaning. Only gestures let them perform their function, continuing and completing the body's action. In this way, the object becomes part of the body. The body and the object fused by the gesture form a *body-prosthesis*. They do not exist separately, they are connected, they co-exist (although the object's action occurs at a distance). Or rather, the body and gesture transfigure the inert object into a *prosthesis*; and the body, in a combined action with the *object-prosthesis* is transfigured into *body-prosthesis* and is transcended, completed and becomes better able to transform the world and communicate, becoming a *performative body*: a *cultural body* and a *social actor* that is technically, functionally, socially and symbolically better able to transform and communicate. *Objects-protheses* are intimately linked to the body, empowering it and completing it, providing it with wholeness. The body is incomplete and seeks to complete itself, in a constant search for wholeness, continuing itself through objects (protheses). Or perhaps it is the *flesh* that is incomplete and vulnerable. In the life of the body in society, to a certain extent it is objects that construct the *body*, superimposing layers on the *flesh*: physical, functional, sensory, social, symbolic and cultural. It is objects that construct the *body*: an *intentional and body-actor* able to trigger more and more objects, extending it, externalising it (*body-prosthesis*), configuring the techno-cultural environment. We can test a cycle: i) penetration of society, culture and technique in the flesh; ii) cultural construction of the body – intentional, signifying, body-actor (using terminology from Fontanille (2001): the engaged body); ii) disengagement and activation of body extensions in all objects, machines, mimeses, simulacra, constructed environments, networks, technologies...

For consideration in Product Design, it can be said that the aim of bodily wholeness from the prosthetic theory helps us to understand and direct our objects-extensions-of-the-body towards comfort, well-being, quality of life or health. However, by considering all human technological production as extensions or continuations of the body (from the simplest objects to cloning), the theory similarly helps to understand the sense of the evolution of technical and cultural objects, inviting consideration of the technologies that Product Design can or should introduce. The discipline is normally linked to technologies from the Industrial Revolution, and has been adapted to the technologies of the Digital Age, but it is not yet clear if it can or should be linked to emerging technology (biotechnology, nanotechnology).

## Power-Body

The *intentional body* (phenomenologically, semiotically, as an actor and as a prosthetic body) should also be understood bearing in mind the topic of power: i.e., should be read as *power-body*. According to Foucault (2000 [1975], 1992 [1975]) and Giddens (1997 [1991]), the body in life in society can be the stage for inscribing powers, but also for asserting powers (in a constant struggle). Those powers can be exercised using objects, shaping *disciplined bodies* or docile bodies, or objectified bodies, or, conversely, objects can empower bodies. The *prosthetic intentional body* is, precisely, a body empowered by objects, and it can be so to discover and construct the world, to circulate affection, to communicate, to transcend or emancipate itself or, on the other hand, to discipline other bodies (and, in extreme cases, eliminate other bodies). These possibilities differ, and can or must be considered ethically, which gives the intentional body the status of *power-body*.

It is important for designers to perform that ethical reflection on a case-by-case, product-by-product basis, because objects are never passive or innocuous: they always act upon bodies and construct bodies, and they can effectively form disciplined or docile bodies or freer bodies. This is a delicate issue, rarely discussed in Product Design culture.

## The Entangled Body

The *entangled body* refers to the cycle that we tested when dealing with the *prosthetic body*: it is the body entangled in the technological ecstasy enacted by each and every human body. Based on Sloterdijk's (2011 [1998]) thinking, we can elaborate: it is the body entangled in the ecstatic immanence of technological, extensible and protective spheres or, to be precise, a body *centred* on technological spheres, designed based on bodies (prosthetic theory), and also protectors for bodies, but which now form an enormous overall technological, protective and immunological habitat where bodies are necessarily entangled (more than centred). Before the enormity of such a habitat, we are in the presence of fragile bodies or solitary bodies, or before bodies in becoming (creative or destructive becoming?). In the technological, extensive and simultaneously protective sphere, in its entanglements (objects, images, machines, networks, interfaces and interactivities, codes, simulations, hyper-realities, speeds, displacements,

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fragmentations, invasions, fusions, reversibilities, cults, desires, fascinations), all the possibilities are there for Man's body: immersed bodies, solitary bodies, emergences of flesh (in its vulnerability or destructive impulses), *satellite bodies* (inordinate, excessive bodies) (Baudrillard, 1998 [1990]), p. 37), *cyborgs*, or bodies that are constantly learning, becoming-bodies, bodies that transcend themselves.

Under the terms mentioned above, the *entangled body* is a side that project fields must face. The artificial environment is global, truly spherical, the size of the planet, and it is also in our bodies (inside our own bodies). The body of the spheres theory is also the body entangled in multiple, progressively more reactive, sensitive and intelligent interfaces, characteristics of a world connected in a network and its infinite terminals. How to design for these bodies? Modular, interchangeable and connectable components for *cyborgs*? Customisable components? Reversible objects for an indistinct interior-exterior of the body? (Are we all *cyborgs*?). It is sensible to consider: that we have designed these prosthesis-protection objects for a long time, but not for cybernetic organisms or fictional beings; our bodies were always linked to the environment; that our bodies are in constant becoming, even before renewed challenges; and, furthermore, that the body's experience, in its becoming, can be enriched with more banal or more sophisticated objects. For example, providing an amputated body with an artificial limb is, *a priori*, an enriching experience.

The critical reflection by authors like Baudrillard (1991 [1981], 1995 [1970], 1996 [1976], 1998 [1990]), Virilio (1993 [1990], 2000 [1995], 2000 [1996]) or Le Breton (2001, 2004) helps to understand to what extent, under false pretexts of liberation (sexual, physical, technological, etc.) the body, as a mere accessory of presence or glorified as a commodity, entangled exclusively in *virtual spaces* and in the law of *real time* and, therefore, obsolescent, or reduced to a mere code, runs the risk of being reduced to an object. This aspect is highly reductive and this is why designers must know how to avoid it, on the pain of facing a heinous confusion between the objects they create and their point of reference – the body.

Objects are not passive. They can contribute to the loss or obsolescence of the body. This loss can be observed in several ways: in an excess of exposure to *virtual spaces* and *real time* (less contact with the place and with others) or in an excess of frivolous (and sometimes dangerous) invasions and transformations of the organism; or through common objects, when they are not properly designed. An object that does not perform its function well (in carrying out a task or communicating with others) impoverishes the bodily experience. An object – for example an office chair – that encourages sedentary habits helps make the body obsolete. On the other hand, an office chair that allows bodily actions and movements, *acts against* sedentary habits, i.e., it enriches the body's experience.

Contemporary speed seems to create an increasingly large space for fluidity and mobility. New bodily *mobility* is required, rethinking objects.

In the face of excess connections to information networks or the excess of *contemporary speeds*, it is sometimes good to pause or momentarily disconnect. At times, it is preferable for us to remain switched off... for a little longer.

## The Hybrid Body

The *hybrid body* is also an entangled body, but it is committed, sensorially and sensitively, in its involvement with everything: with other bodies (human or otherwise), communities, territories and technologies – in the global sphere that we have built. It is the body that Serres (1985) showed us: a sensitive body that is *among* the things in the world, which is mixed and fuses with them, and therefore effloresces and at the same time fades away. It is, therefore, a body that is also in others and in things, that passes to them, that disseminates and multiplies in them. It is a body that learns, that rebuilds and exceeds itself, at all times in its life. It is always contingent, open to relationships: with other bodies and with all the things in the world.

It is a view that shows that, in a technological habitat, there are opportunities for bodies to avoid exceedance, reduction or objectification; that bodies can always be enriched. This view is of notable importance for those who design objects. The *hybrid body*, as described, brings together senses, intentionality, semiotic exchanges, exchanges in affection and literal exchanges – through which we fuse with the world and with things. It is enough to think about a replacement prosthesis and the abilities it can return to an *incomplete body*. It is enough to think about any object that performs its function well. They are *hybridisations*. The approach to the *hybrid body* serves to exhort the promotion of a more and more accurate, subtle and sensitive design practice.



## The Virtual Body

The *virtual body* is the body considered in light of *virtualisation* processes. According to Lévy (2001 [1998], p. 12) the virtual is not false, illusory or imaginary, nor is it the opposite of the real; it is what is found in creative power, which opens possibilities and meanings. Following Deleuze's (2000 [1968], p. 345-347) distinction between the possible and the virtual (the possible is a process of realisation and the virtual is a process of updating: of difference, divergence and multiplicity), Rajchman (2002 [1998], p. 117) complements this, stating that the distinction includes an attempt to understand the notion of the potential outside pre-established identities of form, function and place, leading to a principle: *the best of the worlds is the most multiple, the most virtual*. We can summarise as follows: the virtual is what is found in creative power, open to multiple updates, multiple possibilities and multiple meanings – in the body, for example. For Lévy (2001 [1998], pp. 25-31), the body is updated or virtualised by things coming together and mixing (other bodies, sport, drugs, objects or technologies) constantly becoming *other*.

When designing, it is certainly challenging to think virtually: thinking about the multiple potentialities that an object can give to the body, about the multiple potentialities of the object itself. But what is a *virtual object* like? When discussing Architecture and the *house*, Rajchman (2002 [1998], p. 123) states that the *virtual house* is a house whose design, space, construction and intelligence develops the greatest number of *new relationships* (and the *house* can be replaced by any artificial object). Nevertheless, there is clearly a problem: the *house* still needs to be designed (Rajchman, 2002 [1998], p. 123).

## The (Creative) Becoming Body

The *body in creative becoming* is also a body that refers to all connections, contingencies and virtualities but has to be built by each person. It is a creative side that each body may, or may not, construct. We loosely link this side to the *body without organs* developed by Deleuze & Guattari (1995 [1972], 2007 [1980], pp. 199-218) and Deleuze (2011 [1981], pp. 93-109), about which Gil (2008, p. 181) states precisely that is not a body that is given, but is instead the result of construction. It can be the body produced by dancers when they dance, by thinkers when they think, by artists when they create, by architects or designers when they design; or it can be the body produced by those who enjoy or use the creations of those creators. It can be. Because it will always need to be constructed. It will need to construct itself as a creative body – that is, as the creator of singular and transforming *work*.

As we have mentioned, designers can/should seek to construct themselves as *bodies in creative becoming*. As for the objects they design, they can/should contribute to the creation of other bodies in creative becoming but clearly that creation already depends on those bodies' pre-disposition.

## The Transcendent Body

It is not easy to construct a *body without organs* or a *body in creative becoming*. Even so, bodies can become *more of a body* – transcending themselves – in their connections and mixtures with the things in the world. The *hybrid/mixed body* developed by Serres (1985) pointed towards this path – the particularity of bodies becoming hybrids with things, efflorescing at all times. Latour (2004) develops this idea, but specifies how an object can make a body *more of a body*. As this seems to be extremely relevant to designers' consideration, we summarise Latour's approach, defining this last consideration about the body as the *transcendent body*. According to Latour (2004), for the body to be enacted, for it to become *more of a body* (and therefore transcend itself), we need to learn to be affected (aware, alert) by things and by others, that is, the body must be pre-disposed to learning; but it is also necessary for things to ensure learning, and that they effectively affect the body. The body is in a constant process of articulation and construction, through its relationship with things (it is formed as a constant *assemblage* – multiple, never singular), but things can affect/effect it to a lesser or greater extent. Artificial objects can also provide different levels of learning for the body; the more learning they provide (and the more affectation/effectuation nuances they produce), the more they articulate with and construct the body. Objects can/should be *mediators* and actors in the process of building the body (and not merely intermediaries) (Latour, 2005, p. 39, 71). Objects can contribute to the body becoming *multiple, more of a body*, transcending itself at every moment.

It is up to designers, therefore, to create objects that help enrich bodies' experience, considering that they are constantly constructed and opened, and that every body is simultaneously singular and multiple. They should make each body *more of a body*: viewing objects as mediators and actors, creating objects that enrich learning, objects that affect the bodies through subtle differences in expression (empathetic, signifiers) and, in that way, truly effect them

(this is how the body transcends itself). It is an ethical role. Because objects can also serve to shape bodies in other ways, not to liberate, emancipate, enrich them or make them transcend, but to domesticate, make docile, or negate them.

Mediating objects that enrich the body can be prostheses, protection, interfaces or body simulations (doubles, copies); they may be objects that call upon the body's precision and/or emotions, movement, mobility and flexibility, or comfort, or *levity*; they can further be seen as *folds* (Deleuze, 1988) that are born of bodies and that transform them in the enormous *pleat* of the world.

## CONCLUSIONS

Interpretively and critically mapping the *views of the body for Product Design* described above, which corresponds to a *map-model* presented as the result of our Ph.D. thesis (Dias, 2014), aims to help consolidate a wider reflection on *corporeality* in Product Design culture and particularly in project culture. This should be viewed like a *true map*. Just like the points (intersections) on a road map, the reflections shown are not arranged randomly (they correspond to a *territory*: the territory of the body) and have connections between each other. Nonetheless, as a *map*, we consider the possibility of entering it at any point – at any vision of the body; in the same way that it is possible to relate visions (reflections) in a variety of ways. A map can, by its very nature, be corrected and amended. According to Deleuze & Guattari (2007 [1980], pp. 32-33), the map *structure* is open, it can be connected with different dimensions, it can be disassembled, reversed, and can constantly receive modifications; a map can also be torn, it can be turned upside down, it can be adapted to editing of any kind; it can be drawn on, built like a work of art, a political action or a meditation; a map is truly multiple, it is a *performance*. A map is a guide, it is a mediation, but it is also a multiplicity, an opening.

The mapping of visions of the body proposed here can, therefore, be understood as a system for locating and guiding, but new connections can be drawn on it, establishing new intersections. It can be amended and expanded. Designers can use it to find their *destinations* or to lose themselves (which happens when maps are used). We challenge researchers to investigate other possible connections, to contribute with new intersections, articulating them with our *map*, questioning it and developing it and even throwing it away, replacing it with another that is more complex and malleable; as complex, malleable, ephemeral, vulnerable, in fact... as the body in contemporaneity.

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