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# Imaging the Visceral *Soma*: A Corporeal Feminist Interpretation

by **Ingrid Richardson and Carly Harper**


## Abstract

*Feminist philosophers of technoscience have long argued that it is vital that we question biomedical and scientific claims to an immaterial and disembodied objectivity, and also, more specifically, that we disable the conception of medical visualising technologies as neutral or transparent conduits to the "fact" of the body. In this paper we suggest that corporeal feminism is well situated to provide such a critique. Feminist phenomenologists over the past decade have theorised embodiment in a number of critical ways, many deriving concepts from the work of Merleau-Ponty, and emphasising the pliability and diversity of our body images and corporeal schematics. Others such as Elizabeth Wilson, Cathy Waldby and Drew Leder have considered the interdependence of our inner biology or viscerality with the socio-cultural inscriptions of embodiment. In this paper, these adaptations of phenomenology, and their account of the specificity and depth of embodied being, will be discussed and applied to the discourse of biomedicine and the apparatus of magnetic resonance imaging (MRI).*


## Introduction

> The human body is permanently open to its surroundings and can be composed, recomposed, and decomposed by other bodies.
>
> (Moira Gatens, 2000, p. 61)

In contemporary visual culture the technical enhancement of the eye is often more accurately a translation of information which is not see-able, a making-accessible of that which is either not immediately visible (but through mediation can be made available to vision), or not visibil*isable* (by converting into graphic images data readings of that which would never be available to vision). These technologies, as aspects of the eye-function, seemingly enable us to see and know everything, from the DNA nuclei of a virus to the surface and texture of distant moons. We are now familiarised with a growing number of instrumental or hypermediated visions, via scopic tools used in science and medicine such as ultrasound, x-ray and endoscopes, among other scanning devices which translate the opaque into the visually accessible. Increasingly, instruments of vision permeate our mundane sensibility, such that vision is subject to the material and technical proclivities of the apparatus. Yet, in contemporary technoscience and biomedicine, it is assumed that imaging is a non-interventionist, mechanistic practice which transparently observes and records: an ocular subject (i.e., the pathologist, doctor or scientist) is configured as distinct from a world composed of orderable objects (such as the human body), each of which is waiting to be dis-covered and described. In these processes of biomedical imaging the corporeal and cultural agency of the body is marginalised.

As feminist philosophers of technoscience have argued, it is vital that we question biomedical and scientific claims to an immaterial and disembodied

objectivity, and also, more specifically, disable the conception that technologies provide neutral or transparent conduits to the fact of the body. In this paper we suggest that corporeal feminism is particularly well situated to provide this critique. Feminists and phenomenologists throughout the nineties and into the new millennium have theorised embodiment in critical ways, many deriving concepts from the work of Merleau-Ponty and emphasising the "pliability" of the body (Kirby, 1997), while others have turned to the interdependence of our biology or viscerality with the technocultural inscription of embodiment (Leder, 1990, 1999; Waldby, 2000a; Wilson, 1999). By reworking the fundamental tenets of phenomenology, both corporeal feminists and "body-theorists" such as Drew Leder account for the *specificity* and *depth* of embodied being, and the combined effect of visualising apparatus and embodied perception in our collective understandings of the body. In what follows, these insights will be discussed and then applied to the discourse of biomedicine and the apparatus of magnetic resonance imaging (MRI).

**Corporeal Feminism and Body Theory**

Corporeal feminism is associated with a diverse group of predominantly Australian theorists including Elizabeth Grosz, Elizabeth Wilson, Moira Gatens, Genevieve Lloyd, Vicki Kirby, Cathryn Vasseleu, Rosalyn Diprose, Penelope Deutsher, Robyn Ferrell, and Gail Weiss.[1] In a move reminiscent of Merleau-Ponty's relational ontology, corporeal feminists suggest that we might separate the cultural and material or corporeal as a way to understand them, but their interrelation nevertheless precedes that separation. Corporeal feminism has emerged, in part, in response to the tenacity of this binarism. The idea that reality is a wholly cultural or discursive construction empties the body of material agency, or renders it a passive surface of inscription upon which culture writes.

The confluence of corporeal feminism and phenomenology highlights the immediate, specific and the "concrete" conditions of an embodied subjectivity, which conventional phenomenological perspectives often fail to recognise in any localised context. Simply centralising the role of the body is in itself problematic for feminism, as it seeks to avoid the essentialist reduction of women to their bodies, or universalising the notion of what a body is. Rather, sufficient consideration must be given to how embodiment is lived out in its *specificity*, that is, not only in terms of its corporeal proviso, but in its inescapably cultural, social, historical, gendered, technological *situatedness.* There is not a universal body, or even two gendered bodies, but an ever-changing and disorderly wealth of corporeal modalities. Although feminist theorists focus their concern on the problematic of gender and the sexed body, a consequence of their deliberate attentiveness to being-in-difference is the potential recognition of a number of other ontic osmoses emerging from the circumstances of *techno-material specificity*.

Thus, for example, Gatens's concept of the imaginary body articulates *specificities* across cultural practices and contexts, and attempts to show how "culture marks bodies" by producing the variable parameters within which bodies are generated (Gatens, 1999, pp. 230-231). In this regard, she writes:

> The imaginary body is socially and historically specific in that it is constructed by: a shared language; the shared *psychical significance* and privileging of various zones of the body … and common institutional practices and discourses (medical, juridical and educational) which act on and through the body. (Gatens, 1996, p. 12)

These practices and discourses use the body as a "vehicle of expression", targeting particular parts of the body in terms of their interests; as bodies we are

[1] The special issues of *Hypatia* on "Australian feminism" Vol. 15, No. 2 (Spring 2000), and "Feminism and the body" Vol. 6, No. 3 (Fall 1991), and the special issue of *Australian Feminist Studies*, Vol. 14, No. 29, all contain articles from many of the corporeal feminists I have named. See also: Elizabeth Grosz (1994). *Volatile bodies: Towards a corporeal feminism*. Sydney: Allen and Unwin; Elizabeth Grosz (1995). *Space, time and perversion: The politics of bodies*. Sydney: Allen and Unwin; Gail Weiss (1999). *Body images: Embodiment as intercorporeality.* New York: Routledge; Moira Gatens (1996). *Imaginary bodies: Ethics, power and corporeality.* London: Routledge; Moira Gatens and Genevieve Lloyd (1999). *Collective imaginings: Spinoza, past and present.* London: Routledge; Vicki Kirby (1997). *Telling flesh: The substance of the corporeal.* New York: Routledge; Cathryn Vasseleu (1998). *Textures of light: Vision and touch in Irigaray, Levinas and Merleau-Ponty*. New York: Routledge; Rosalyn Diprose (1994). *The bodies of women: Ethics, embodiment and sexual difference*. London: Routledge; Elizabeth Wilson (1998). *Neural geographies: Feminism and the microstructure of cognition*. New York: Routledge.

all defined in terms of this imaginary body, and *always-already* historically and culturally delegated. While her critique does offer an alternative to the nature/culture or sex/gender model of conceptualising sexual difference, Gatens loses some of the material specificity and corporeal excess of embodiment captured by Merleau-Ponty. For Gatens the body is always wholly recuperated by the discourses which precede it, and as such she must reject the idea that tools, and the praxes which surround them, can have sometimes unintentional and ontic effects upon the body, and thus morphologically fashion different kinds of bodies.

In her theorisation of the body image in *Body images: Embodiment as intercorporeality*, Gail Weiss (1999) acknowledges the body's potential for technosomatic osmoses. Similarly to Gatens, she argues that as-bodies we are embedded within cultural contexts where some kinds of endo- and exosomatic body forms are privileged and naturalised over others (Weiss, 1999, pp. 66-67). This explains, for example, the way in which immunological and pathological discourse surrounding AIDS and HIV define the parameters of an ideal body that is heterosexual, white, and male: a body which is not "penetrable". As Waldby (1996) argues, this describes the immuno-competent body, while the immuno-compromised body includes women and homosexual men; that is, leaky and permeable bodies without integrity. Within such discourse, itself thoroughly infiltrated by medical and military visualising apparatuses, and military metaphors of invasion and border protection, both the surface body and the body interior are configured in particular ways according to fixed representations of body-standards. Yet for Weiss bodies are particularised not only or even predominantly by sex or gender, but through an *intercorporeal* and mutable palimpsest of cultural norms according to race, ethnicity, age, class, disability, equipmental fields and tool-use. While there are hierarchies of collective body images within which we are expected to "install" our individual corporeal schemas, the body image is also a site of cultural contestation which is open to "a vast horizon of possible differences":

> Exploring the corporeal possibilities that have been foreclosed by a given culture's own imaginary itself helps bring into being a new imaginary - one that does justice to the richness of our bodily differences. Changing the body image, I maintain, must involve changes in the imaginary … [W]e must in turn create new images of the body, dynamic images of non-docile bodies that resist the readily available techniques of corporeal inscription and normalisation that currently define 'human reality'. (Weiss, 1999a, p. 67)

Weiss thus provides an important elaboration on the body image in terms of its potential for corporeal and cultural transformation. Indeed, more than this: the body-image retains its material agency and relational ontology while simultaneously being embedded within specificities of culture and, we would add, specificities of media and equipmentality. Her theory allows for the possibility of an "alternative metaphysics" which can "adequately account for the processes of construction, destruction, and reconstruction that are constitutive of human corporeality" (Weiss, 1999a, p. 67). In accounting for both the equipmental and corporeal effects of magnetic resonance imaging, we will suggest that such an "alternative metaphysics" is emerging within technoscience.

More recently, corporeal feminists such as Grosz (1994, 1995) and Wilson (1998, 1999) have pointed out that there is a lack of attention directed towards the *material* specificities of biological function, and consequently to the space and matter-ing of the organic, fleshy and visceral endosoma. In other words, the body has largely been figured as purely exosomatic – as a surface for inscription and representation. Wilson (1999), for example, analyses hysteria within an informed critique of somatic and biological detail, arguing that a *full-bodied* account of the body must do more than treat the body as a shell or container, or as a surface for social inscription. Rather, we must become more literate about our knowledge and experience of biology - including the muscular capacities of the body, the function of the internal organs, the biophysics of cellular metabolism, and the microphysiology of circulation, respiration, digestion and excretion (Wilson, 1998). This critique has become increasingly relevant as it pertains quite specifically to the relation between televisualised technosoma, and the incursion of tele-technologies into the body, particularly in the context of endoscopic apparatuses which work to render the inside of the body visible, and thus literally draw the visceral into our collective and individual body images.

In *Volatile Bodies,* Grosz (1994) tackles this issue of the opaque and overlooked corporeal inside as a way to deconstruct both the mind and body binarism and the traditional Cartesian model which privileges the psychical interior (consciousness) over the mute corporeal surface, effectively masking the essential significance of material differences and specificities. Against this, Grosz theorizes a non-hierarchical process of *articulation* between inside and outside,

and the biological and the psychical (Grosz, 1994, p. 7), contending that such an inversion of the inside/outside logic will inevitably speak the concrete specificities of embodiment.

Combining the insights of Schilder with Merleau-Ponty's *corporealisation* of perception, Grosz introduces the term "body phantom" as a way both to describe an alternative to the common understanding of technology as extension or prosthesis, and to adjust our conceptual grasp of artificial or synthetic augmentations to the "natural" body:

> The body phantom is the condition of the subject's capacity not only to adapt to, but also to become integrated with various objects, instruments, tools and machines. It is the condition of the body's inherent openness and pliability to, and in, its social context. ... It is the condition that enables us to acquire and use prosthetic devices - glasses, contact lenses, artificial limbs, surgical implants - in place of, or supplementary to, our sense organs. (Grosz, 1992, p. 6)

Yet, while attention is paid to prosthetic somatology, by some accounts Grosz still does not seriously attend to the corporeal interior, and "all the oozings and pulsings that literally and figuratively make up the differential stuff of the body's extra-ordinary circuitry" (Kirby, 1997, p. 76). In this context, it is worth considering in some depth the work of Drew Leder, a body-philosopher who attends to the complex intertwining of inner and outer corporeality.

Leder's principal thesis in *The Absent Body* explores the way in which the body in-use partially recedes from our conscious perception, and specifically how this tendency to some extent encourages and supports a Cartesian-like metaphysics of disembodiment (Leder, 1990). In many of our day-to-day habitual activities, our body retracts from immediate awareness, and this withdrawal has led us to believe that the body is epistemically and agentically peripheral to the actively knowing and perceiving mind. According to Leder, it is this intrinsically paradoxical nature of bodily presence - its inescapable presence as our corporeal ground on the one hand, and its tendency towards absence on the other - that accounts for the tenacity of the mind/body hierarchy in Western thought.

Leder identifies three modes of absence specific to human embodiment - *focal*, *background* and *depth* disappearance. Firstly, he argues that focal disappearance is an effect of the way in which the sensorimotor surface of our body - our corporeal extremities - are characterised by a form of self-concealment which is directly related to the "ecstatic" nature of corporeality. Contact with the world and its objects is first and foremost through the body-surface, and as such this exterior functions as the boundary and horizon which makes such tactile, kinaesthetic or multi-sensory acquaintance with that world possible. When one's hand touches another physical object, the phenomenon of a "null point" occurs, such that we attend to the *telos* or trajectory of action, or to the general process of handling itself, rather than to the point of contact between skin and the object. The face, the hands, and the mouth, by virtue of their corporeal specificity, most frequently play this focal role in our communication with the world (Leder, 1990, p. 105).

Leder supplements this description with the slightly different yet complementary notion of background disappearance, which describes a type of absence that occurs when regions of body are *not* the focal origin of our sensorimotor engagements, and momentarily adopt a background or supportive role, again disappearing from explicit awareness (Leder, 1990, pp. 25-26). This describes the sensory engagement of more complex and/or articulated actions, such as holding a book while in the process of reading, or walking while conversing on a mobile phone; in both cases, the hand plays a background rather than a focal perceptual role. Although both focal and background disappearance are not directly related to the visceral, Leder derives the final mode of absence - depth disappearance - by defining it in relation to the other two modes which have pertained specifically to the body perimeter. The paradox of bodily presence-absence is for Leder quite clearly of a different order when applied to our corporeal depths, where the mode of disappearance is more pronounced and to a large extent irrecoverable. Our inner bodily processes and organs remain perceptually elusive, in contrast to the more tangible and visible surfaces of our somatic exterior which, by virtue of their ecstatic being-in-the-world, sustain a more prominent and pervasive presence in the everyday experience of our environment:

> My hands, in order to explore and work upon the world, must extend outward from my corporeal extremities. My expressive face can form a medium of communication only because it is available to the Other's gaze. No organ concealed in the hidden depths of the body could actualise intersubjectivity in this way. (Leder, 1990, p. 11)

The visceral, in contrast to the perceptual or sensory surface of the body, is marked by a deeper, innate form of resistance which "falls back" from our conscious perception and control (Leder, 1990, p. 69). Leder identifies these visceral resistances - which vary according to their nature as muscle, organ, flesh, blood and bone - such that the "notion of depth indicates not only a physical site *but a genuinely distinct phenomenological dimension* [italics added]" (Leder, 1990, p. 53). This distinction works according to a dynamic of exosomatic outward projection and endosomatic introjection, where the latter falls back to a level of imperceptibility.

Thus, Leder concludes, it is only the corporeal surface, able to "actualise intersubjectivity" and shape our everyday experiential field, which accounts for the tendency within the tradition of phenomenology to identify the body principally in terms of its outer boundaries. Thus, we have cosmetic surgery performed on our faces and breasts, not on our spleens; we don't control our digestion with the same degree of "personal mastery" with which we control our posture or surface musculature, because it functions primarily according to the tacit structure of autonomic[2] operation (Leder, 1990, pp. 46, 48). Admittedly, as Leder acknowledges, while our surface organs may also be forgotten via their varying structural roles, focal or background, this self-effacement is typically temporary and *reversible*. Visceral processes, on the other hand, exhibit an innate resistance, because they recede beneath the intentional "arc" of personal control altogether:

> Unlike the surface organ in background disappearance, a viscus [internal organ] is largely irreversible with corporeal foci. It cannot be summoned up for personal use, turned ecstatically upon the world. Its recessiveness is not simply the function of a current gestalt but of an innate resistance. (Leder, 1990, pp. 54-55)

By acknowledging the particular phenomenological significance of the visceral dimension of our embodiment, Leder goes some way towards addressing the deficiencies both he and corporeal feminists have identified in Merleau-Ponty's project. As he suggests in a later article, the "primacy of embodiment and the primacy of perception that Merleau-Ponty advocates are usually understood as one and the same thesis", yet the visceral foundation remains largely unacknowledged (Leder, 1999, pp. 200-202). In particular, Leder draws attention to Merleau-Ponty's term "flesh", which he suggests already embodies connotations of the bodily surface - its "superficial muscle and fatty tissue" - and thus reveals phenomenology's tendency to privilege this region of the body (Leder, 1999, p. 204). Leder's specific response to this oversight is to replace the singular word flesh, with the terms "flesh and blood", which account for both the dry exterior and the previously suppressed "wet" dimension - the word "blood" operating as a trope for viscerality.

From the perspective of corporeal feminism, however, Leder's analysis is flawed in several respects. Firstly, he draws a dramatic distinction between our experiences of the exosomatic and endosomatic dimensions, claiming that we can only ever attain oblique awareness of the latter. This analysis of bodily absence depends on a definition of the visceral as the region of our body which is invariably secluded and concealed from our everyday awareness and perception. Accordingly, our visceral depths constitute the most hidden dimension of our lived embodiment, and thus for Leder "rarely make an appearance in our life-world" (Leder, 1990, p. 111). The way in which Leder figures this relation as largely disconnected and divided by an axis of visibility and sensation is problematic, however, in that it fails to capture the meshing of the visceral into the lived experience of our embodiment, or our experience of what Julia Kristeva (1982) has termed the *abject*, the material surfacings of blood, mucus, and faeces which properly belong in the ontic domains of neither object or subject. In this respect, women's bodies regularly transgress Leder's conceptualisation of the perpetually contained and unrevealed visceral interior: when menstruating, for example, our visceral depths "come to the surface" of our corporeality; when pregnant, inner bodily changes and foetal movements are frequently both focal and visible. Leder's model is thus unarguably one that describes a specifically masculine embodiment, and viscera which are more easily "negotiated" and overlooked.

Nevertheless, it would seem that Leder's recognition of our bodily interior is particularly salient in the context of biomedical imaging apparatuses which precisely target these previously imperceptible visceral depths. Magnetic resonance imaging, for example, like other biomedical imaging technologies, is presumed to enable *direct* perception of viscera-in-action. Yet Leder suggests that the variety of exscriptive technologies used to visibilise internal organs only highlight and exacerbate our alienation

[2] Autonomic is a physiological term referring to the non-voluntary functioning of the body. e.g., the autonomic nervous system is responsible for the control of bodily functions not consciously directed, such as heartbeat.

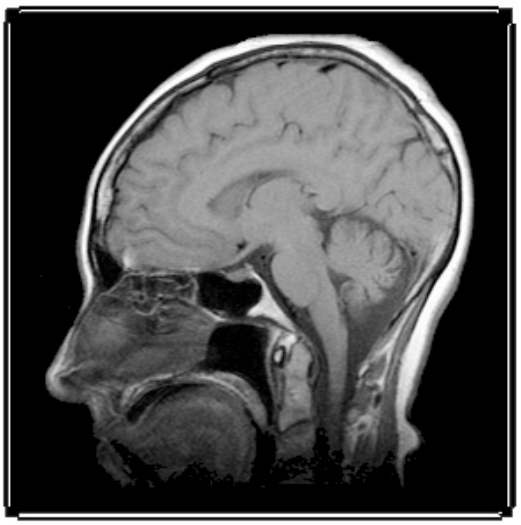
from the strangeness of our own interiors. Clearly, his reliance on a strict inside/outside dialectic, belies a more latent oppositionality between nature's "otherness" and the cultural known, and rests on a conventional interpretation of the relation between our bodies and visualising prostheses. In contrast, feminist theorists such as Haraway (1991) have revealed the cyborgian affinities between our own sensorium and those of perceptual machines, recognising that the body in its entirety is always open to sociotechnical arrangement. We can and do have an instrumental awareness of the interior of our bodies; our familiarity with skeletal representations via X-ray technology is but one example of how we quite familiarly envision our insides within an instrumental framework. Magnetic resonance imaging is another example of such cyborg perception.

As we will show, the hybrid condition of technical and corporeal seeing can be explored via the particular biotechnological apparatus of magnetic resonance imaging. As a computer-conversion technology, MRI optically renders quantitative non-optical data into recognisable visual images which can be 'read' and interpreted on the screen. In this respect, MRI follows the usual visual prejudice of scientific discourse in its translation of non-visual information into a visual display. Foregrounding the role of instrumentation in medical knowledge thus reveals the way in which technics and techniques are both equipmentally and corporeally embodied; that is, the way they are incorporated into our perceptual and bodily experiences of the lifeworld.

**Magnetic Resonance Imaging**

> MRI deploys images from body territories which have remained dark to other kinds of illumination … [it] has shifted our sense of transparency. (Bettyan Kevles, 1997, p. 176)
>
> If all technology implicates and supplements bodily organs … then the biomedical technologies give an extra depth to this implication, and in the process throw into question the viability of a distinction between natural inside and technical outside of the organ-ism, or of setting out any defining limit or distinct interface between organs and technics. (Catherine Waldby, 2000, p. 31)

Magnetic resonance imaging is among a number of contemporary digital imaging technologies which are renowned for their ability to non-invasively visualise the interior as it is "live and functioning" (Kember, 1998, p. 55). Typically, scans are made of the head (brain), knee or torso, and these various body-parts are enclosed in a cylindrical apparatus which generates a powerful intermittent magnetic field. The intensity of the magnetic field works to excite the alignment of hydrogen atoms in the body. Each time the emissions cease, these atoms return to their original "relaxed" positions, emitting small electric currents which vary according to the density of their location in organs, tissue, blood or bone. In this way, the often subtle biochemical and physical differences between distinct corporeal substances can be calibrated and converted into a high-resolution greyscale image. At each end of the spectrum, tissues which are high in water content or hydrogen appear white, whereas those which do not, such as bone, are darker; in particular, MRI is able to reveal the complexity of soft tissue and organs. The resulting images are the work of expensive and powerful computer hardware and software technology, and they offer precisely detailed macro-perceptual slices or cross-sections of the body which are recognisable in their photorealism even to the lay observer (see figure below).



Magnetic resonance image of male head
Joseph Hornak (2003), Rochester Institute of Technology

For most patients, scanning time may last for around thirty minutes, during which the body or body-part must be kept completely still. In our observations of the MR machine in operation,[3] we were firstly struck

[3] Many thanks to Dr Steve Davies for inviting us in August 2000 to observe the magnetic resonance machine in operation at St John of God Hospital, Subiaco, Western Australia. Both Dr Davies and the

by the sheer size of the cylinder required for full body and head scans. Upon entering the scanning room clad in protective vests, after several minutes we found that the very loud pulsating hum - caused by the flux of magnetic field generation - was moderately difficult to bear. From our brief experience, it was immediately clear that for human body-part interiors to be rendered as data in this way, and then translated as sectioned images onto transparencies to be "made ready" for the doctor's expert interpretation, the patient must confront both the arduous work of remaining motionless, and the daunting and concrete materiality of the throbbing enclosure. In a visceral sense, too, the hydrogen atoms in the body matter to be imaged can be said to "behave" in a techno-specific way according to the density of the particular corporeal substance in which they are located. Thus it is not the case that biomedical imaging produces a dematerialised data-body, but rather that the infosoma or human-apparatus gatherings specific to particular scanning procedures are undeniably corporeal and substantial. It is these technosomatic effects, specific to the body-tool ontology of MRI, that are of primary interest here.

In much biomedical imaging the apparatus translates non-visible information - or information that is simply not of the order of the visible - into a readable macroscopic image. The ensemble of tools and bodies - complex machines, scanning devices, screens and hard drives, and those doctors and technicians who operate, service and adjust them - work to reveal that which can be configured as data code, thereby rendering unknowable that which cannot be so rendered. The scanning process may also contribute a number of wayward "artefacts", often inexplicable visual objects in the image which, if not recognised as such by the expert, can be misinterpreted. The patient-body, immobilised, "answers" viscerally, or at a molecular level, to the magnetic fields or sound waves of the apparatus. The doctor or radiologist appropriates or embodies a dissected and 'machinic' vision, or is able to prioritise a particular computer-aided "order" of vision in greyscale, where gaseous or fluid substances are luminous, and solid or dense substances such as bone are represented in darker shades. In James Gibson's terms, the *visual world,* where sight is ecologically intertwined with other senses to create three-dimensional depth, is obscured in favour of the *visual field,* where sight is intentionally detached from the environment and the eyes fixated to create two-dimensional or projected visuality (cited in Jay, 1994, p. 4). At no juncture is this process a transparent seeing of what is objectively there, but rather a phenomenological, mediated, artifactual and many-sided collaborative *effect* or *achievement.* As Ihde (1991) suggests, a more accurate understanding of technoscientific and expert observation as an active and corporeal seeing, acknowledges the essential co-operative effects of praxis and perception, and of instruments and bodies, in all scientific activity; that is, the *embodiment relations* that ensue.

In a similar way, Cartwright argues that the active body-building practices of biomedical science must be acknowledged as they are embodied in its technologies and domains of expertise (Cartwright, 1995, p. 28). As Haraway famously states:

> The 'eyes' made available in modern technological sciences shatter any idea of passive vision; these prosthetic devices show us that all eyes, including our own organic ones, are active perceptual systems, building in translations and specific ways of seeing, that is, ways of life. There is no unmediated photograph or passive camera obscura in scientific accounts of bodies and machines; there are only highly specific visual possibilities, each with a wonderfully detailed, active, partial way of organising worlds. (Haraway, 1991, p. 190)

This position rejects the notion that bodies or machines are entities of either epistemic or ontic integrity, that scientific accounts of bodies are separable from or ontologically prior to technics, or that bodies are in any way reducible to their individual parts. The biological body is *not* the essential body, a reality waiting to be discovered, but *always-already* it is a technically-augmented or technosomatic agent, and always partially of our own fabrication.

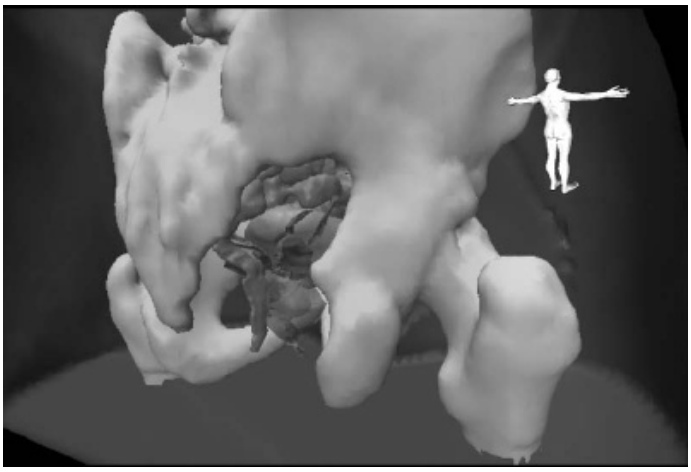
For example, informatic renderings according to the logics of the computer and screen rework the body as a three-dimensional coordinate space to be traversed and explored. MR images, because they can be stacked in such a way so as to produce a three-dimensional representation, are considered primary resources in the creation of 3D animated body-atlases. Software developed for manipulation of MRI, CT and photographic images of the Visible Human Project[4]

resident radiologist kindly gave of their time and expert knowledge in extended interviews.

[4] See http://www.nlm.nih.gov/research/visible/visible_human.html. The Visible Human is a project of the National Library of Medicine in Bethesda, U.S. It comprises two data-sets of what were actual cadavers

configure the data body as topography and landscape, inviting the user on a navigable virtual flight through the Visible Man.[5] In other applications (see figure opposite) users can orient themselves with a mouse-directed avatar. Such representations impart a visceral schematic into our collective body-image, an understanding and experience of our own insides as comprised of a discrete collection of layers and organic components. At times we can sense internally (e.g., the "gut feeling") or haptically (e.g., bumps and lumps such as swollen glands) the material factuality of our interior, but we also rely on the telepresent collaboration of biomedical imaging to visualise both the layout and the dynamic "oozings and pulsings" of the endosoma (Kirby, 1997, p. 76).

In the case of both the Visible Human Project and MRI, there are then several attendant exo- and endosomatic agencies which work to further collapse the subject-object, tool-body distinctions. With regard to an organic agency, for example, breast tissue has long been considered a disobliging participant in ultrasound and mammogram imaging, in that it is materially uncooperative to the manipulations of the scanning device, and its tissues do not always reveal themselves to the satisfaction of radiologist or doctor (Cartwright, 1995).



Visible Male pelvis with prostate gland.
Richard Robb (1996) Mayo Foundation.

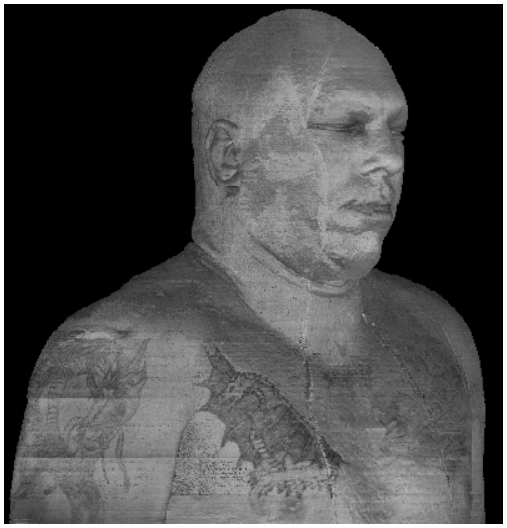
As such, the interior body is imbued with an agency which at times may be inscrutable or obdurate, but it is an agency nonetheless. Indeed, medicine deploys its apparatuses - MRI, PET and CT scans, volumetric models, anatomical atlases - as machines with which to overcome precisely the resistance of viscous and fleshy bodies to scientific modes of knowing. Yet the body in its own recursive materiality can be seen to "order" the ensemble of visualising strategies. MRI, for example, is a technique enabled by several molecular and visceral specificities: hydrogen nuclei have a magnetic resonance signal; fat and water have many hydrogen atoms; human bodies are primarily made up of fat and water, and thus are comprised of approximately 63% hydrogen atoms (Hornak, 2003). This combination of technical "readability" and visceral accommodation render the MR visualising process possible. There exists a complex interrelation, for the phenomenological condition of embodiment is also a primary ontic ingredient. That is, the body-subject's incorporative aptitude, its capacity to *intercorporealise* both tools, and collective yet culturally specific aggregations of the body image, are precisely what enable the various technovisual and medicalised "versions" of the biological body to take hold.

In a less compliant example, in the case of the Visible Human Man the initial MRI imaging process was performed on the intact body due to the quite simple fact that even when frozen at extremely low temperatures, the body-matter could not "hold together" once sliced: the body's mass was "effectively obliterated … each planed section dissolving into sawdust due to its extreme desiccation" (Waldby, 2000a, p. 14). Moreover, even despite such disintegration, the body-membrane

– male and female, launched in 1993 and 1995 respectively - involving an ensemble of imaging techniques. Waldby describes this process as follows: "The body was placed … in a MRI machine and fully scanned. This first imaging process was to provide a template for the intact body, which was to be digitally 'duplicated'. It was then frozen … cut into four sections and each section was CT and MRI scanned. … After that, the body was systematically and very finely sliced. … After each planning, the cross-section of the remaining body section was digitally photographed, so that each photograph registered a small move through the body's mass. Each of these photographs was then converted into a computer data file, and their position in the overall body registered according to the initial template" (Waldby, 2000a, p. 14). The full data-sets enable volumetric stacking, animation and manipulation, and are available for download from the U.S. National Library of Medicine website.

[5] These traversable volumetric interiors actually use flight simulation software in their construction, so the parallel is more than metaphoric (Waldby, 2000a, p. 103).

performs its own ironies; tattoos on the surface of the Visible Male body are tenaciously reconstituted on the *virtual* skin of the volumetric reconstruction (see figure below), such that the uniquely marked identity[6] of the body-in-life resurfaces, and the data-set abruptly loses its status as representative prototype of the human corpus.



Head and upper torso 3D reconstruction of Visible Male data set
William Katz, Multimedia Medical Systems (Robb, 1996)

On the other hand, the technical agency of the apparatus itself collaborates in this body-making. The pictorial logic of MRI imparts a concreteness to the brain's bio-chemical processes, both capturing and privileging abstract non-geometric processes, by paradoxically reducing them to something less complex. These visual delineations of molecular events then serve as "actual" ocular markers of *distinct pathologies*. Here, MRI quite evidently does not function as a transparent or visually isomorphic representation of the body; it instrumentally *extends* and reconfigures the natural scientific subject's epistemological domain, while at the same time the image itself becomes as it were an aspect of the body, a concrete material trace of the body's corporeality. Thus, this visualising process simultaneously translates and recreates the living processes of the body studied (Cartwright, 1995, p. 23). The MR image is a computerised interpretation; a visual model synthesised from emitted pulses and molecular reaction. Crucially, it is only after the MRI signal is transformed by a series of algorithms, and translated by computer, that it is able to graphically register a recognisable visual representation and operable diagnostic form in the shape of voxels and pixels. Thus, while MRI seems perfectly consonant with medicine's historical and epistemological privileging of sight, it is more precisely a process of *translation.* The production of biomedical knowledge, such as the analytical physiological knowledge generated by MRI, necessarily effects a partial instrumentalisation of the body, and thus the re-interpretation and re-configuration of its corporeality.

This reciprocity between body and tool, and the way in which apparatuses such as MRI have been "instrumental" in how we *realise* our inner workings can be theorised as an essential supplement to Merleau-Ponty's body image, such that our interior morphology becomes a requisite part of the relational ontology of intercorporeality. If instrumental ways of seeing are aspects of embodiment, such that observer and observed are inextricably engaged, when that perceptual merger turns inward, inside and outside are similarly confounded. Although Leder is one of few phenomenologists who attend to the visceral, this perceptual arrogation of MRI and other imaging tools directly counters his recuperation of the inside/outside dichotomy, and his claim that the visceral mode of being is one of terminal disappearance. In the case of the Visible Human, for example, the body interior is made available as serialised cryosectioned *surfaces* for use on the Internet and digital-visual media networks, "reconstituted along the lines of scanning and surface data most appropriate for digital image processing and digital file standardization" (Thacker, 1998). Moreover, while for Leder *in vivo* imaging technologies are primarily estranging, revealing an alien and unknowable bodyscape, this overlooks the way in which we have quite readily digested the more familiar somatic terrain of X-ray and ultrasound, and even found them both empowering as evidence of effective surgery or implants, and cherishable as first baby photos. Indeed, biomedical macro- and micro-perceptual imaging manifests our lively insides to sociotechnical apprehension in such a way that it is no longer possible to make clear ontic distinctions between culturally inscribed body surface and exscribed organic or natural interior.

Perhaps particularly in the context of modern instrumentally-mediated medicine - technoscience - any attempt to position the body as a pre-technical or organic point of origin is interrupted when we acknowledge that the body appears only as it is revealed through the instrumental logic and trajectory

[6] Convicted murderer Joseph Paul Jernigan donated his body to medical science while on death row; upon execution by lethal injection his body was appropriated by the National Library of Medicine VHP coordinators and medical experts.

of the technological ensemble itself (Waldby, 1999, p. 21). For example, MRI as a computerised conversion technology must translate the behaviour of hydrogen atoms within the body into data, and this binary code must then be made to correspond in very precise ways to pixels of greyscale in order to compose a coherent image. This kind of instrumental embodiment or infosoma is only possible with the processing speeds and memory capacity of recent computer technology. Moreover, the computer cannot simply "see" inside the body; the corpus must first be metamorphosed as a data-compatible or computational substance. This new technoscientific circumspection is first established as part of the scientist's own partial, mediated and expert perception, and then into popular scientific knowledge more generally. In films such as *Hollow Man* (Wick, 2000) and *The Fifth Element* (Ledoux, 1997), for example, MR imaging techniques and software, such as those used in the Visible Human Project, are appropriated to represent the body as a completely evident and discriminate accretion of layers, which can be built from the inside out (*The Fifth Element*), or visually peeled from skin to marrow (*Hollow Man*). Thus eventually these volumetric representations of the endosoma become a part of our own culturally and technologically contingent perceptions of the body, and finally they are incompletely and variably assimilated into our individual and collective body images.

**Conclusion**

Scientific discourse is both intrinsic to, and inseparable from, the ways in which we understand and live our bodies in contemporary Western culture. Both within its own domain, and in its frequent incursions into popular media, such discourse has delivered the images with which we comprehend our biology and its constitution. Feminist philosophers of science have long recognised that, if specifically *feminist* analyses continue to ignore biology, or to theorise the body primarily in terms of its corporeal perimeter, technoscientific and biomedical discourse will itself remain invulnerable to critique. Molecular genetics, in particular, has become a primary instrumental mode of understanding about the organisation of life, and an increasing range of behaviours are attributed to genetic causes. Yet, as theorists such as Keller (1995) and Spanier (1995) have suggested, the reductionist model of hierarchical control within molecular biology, where DNA is represented as the "master molecule", is only one among many possible interpretations or bio-cultural paradigms. Instead of focusing on command and control, for example, human biologists could focus on metabolism and the flow of energy from the sun, thus centralising the agency of energy conversion systems rather than informatic code (Spanier, 1995). Such views are as accurate as those made about DNA, but are derived from a different focus and a different set of assumptions about what constitutes life. Recent cultural analyses of medical science and its visualising practices by Waldby, Cartwright, Stafford and others are also effective enablements of this kind of critique.[7] As earlier argued, post-phenomenological accounts of endosoma in their specificity also contribute a crucial component to contemporary theorisations of the body.

In this paper we have suggested that a critical and alternative construal of technoscientific vision, specifically biomedical imaging and MRI, and the various practices and agencies surrounding their use, can complicate dominant accounts of technovisual apparatuses within medical science. As we have suggested, the presumption that imaging technologies enable pure transparency draws on a dichotomous logic of knowing - one which separates an observer from a world of external objects that can be independently accessed and properly known. Yet, when the process of observation becomes irrecoverably perplexed by the operative dialects of binary code, radio waves, magnetic fields and visceral specificity, perceiver and object enter an altered order of knowing which radically shifts the relationship between vision and truth. The relation between perception and apparatus, and between body and tool, in the deployment of magnetic resonance imaging is an irreducibly collaborative and specific kind of truth. It is a technosomatic compromise of ontological difference. Rather than a collection of autonomous and distinct entities contributing to a cohesive *telos* of discovery and cure, we would argue that bodies, apparatuses and imagers comprise an often untidy and intercorporeal ensemble of human and non-human agencies. Indeed, the medium- or techno-specificity of magnetic resonance imaging, and the info-soma

[7] Linda Treichler, Lisa Cartwright and Constance Penley (Eds.). (1998). *The visible woman: Imaging technologies, gender and science.* New York: New York University Press; Lynda Birke (1999). *Feminism and the biological body.* Edinburgh: Edinburgh University Press; Lisa Cartwright (1995). *Screening the body: Tracing medicine's visual culture.* Minneapolis: University of Minnesota Press; Barbara Stafford (1993). *Body criticism: Imaging the unseen in enlightenment art and medicine.* Cambridge: MIT Press; M. Berg and A. Mol (Eds.). (1998). *Differences in medicine: Unravelling practices, techniques and bodies.* London: Duke University Press; Cathy Waldby (2000). *The Visible Human Project: Informatic bodies and posthuman medicine*. New York: Routledge.

both produced by and producing such visions, antagonise the fundamental tenets and assumptions of the conventional ocularcentric trajectory, including medicine's claims to being a disembodied, impartial, transparent, non-intervening way of knowing.

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**About the Authors**

Dr Ingrid Richardson is a Senior Lecturer at Murdoch University, Western Australia, teaching in the fields of Multimedia and Cultural Studies. Her research interests include philosophy of technology and science, sustainable communities, new and interactive media theory and practice, and corporeal feminism. She is a researcher at the Interactive Television Research Institute (ITRI, Western Australia) and the Australasian CRC for Interaction Design (ACID, Queensland University of Technology, Australia), and is currently working as contributing co-editor on a book of collected articles entitled *Container Technologies*. Dr Richardson has published in a number of areas including: children's experience of English as Foreign Language software in rural China; the phenomenological effects of new media and virtual environments; the corporeal schematics of mobile communication devices and wearable media technologies.

Carly Harper is a PhD candidate at the University of New South Wales, Australia. Her thesis focuses on the genealogy of the concept of Interactivity in the field of New Media Theory, and explores how historical configurations of user-agency might provide insights into more recent attempts to 'think the relational' in the interdisciplinary field of Human-Computer Interaction (HCI). She is currently working as a research assistant on an e-learning project at the Institute for Interactive Media and Learning, University of Technology, Sydney, Australia.

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