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Brainhood, anthropological figure of modernity

FERNANDO VIDAL

ABSTRACT

If personhood is the quality or condition of being an individual person, *brainhood* could name the quality or condition of being a brain. This ontological quality would define the 'cerebral subject' that has, at least in industrialized and highly medicalized societies, gained numerous social inscriptions since the mid-20th century. This article explores the historical development of brainhood. It suggests that the brain is necessarily the location of the 'modern self', and that, consequently, the cerebral subject is the anthropological figure inherent to modernity (at least insofar as modernity gives supreme value to the individual as autonomous agent of choice and initiative). It further argues that the ideology of brainhood impelled neuroscientific investigation much more than it resulted from it, and sketches how an expanding constellation of neurocultural discourses and practices embodies and sustains that ideology.

Key words brainhood, brain imaging, cerebral subject, modernity, neuroculture, self

INTRODUCTION

The hype about neuroscientific results, especially those that come in the form of brain scans, began in the early 1990s, and shows no signs of relenting. It is not, however, a purely media event. In addition to the manifold developments it might be connected to – from the rise of biological psychiatry and

the interests of pharmaceutical industries to the privatization of health systems and the interests of insurance companies – the neuroscientific hype highlights the ascendancy, throughout industrialized and highly medicalized societies, of a certain view of the human being. This view, which I have called 'cerebral subject', has already a quasi-logical definition: 'Person P is identical with person P* if and only if P and P* have one and the same functional brain' (Ferret, 1993: 79). Although it is not entirely clear whether 'functional' here designates simply a brain that works, or its functions and 'contents' as distinguished from its anatomical structure, the formula epitomizes a widespread belief about personal identity: that to have the same brain is to be the same person, and that the brain is the only part of the body we need in order to be ourselves.

As a 'cerebral subject', the human being is specified by the property of 'brainhood', i.e. the property or quality of *being*, rather than simply *having*, a brain.[1] Reacting to the thought-experiment version of the above-quoted formula – 'If the brain of A could be transplanted into the body of B, then it is not B who would receive a new brain, but A who would gain a new body' – leading neuroscientist Michael Gazzaniga (2005: 31) commented: 'This simple fact makes it clear that you are your brain.' Neuroscientists' writings and interviews for general audiences, media discussions of neuroscientific research, and the vast neurocultural constellation we shall deal with below offer countless variations of such a claim.[2] How, however, have we come to the point that the assertion 'You are your brain' may sound indisputable and self-evident?

The cerebral subject is obviously not the only anthropological figure to be found in western and westernized societies, nor the only way of understanding ourselves with roots in the life sciences. Just to mention two of these, immunology and genetics have been linked to fundamental selfhood issues. The former has been defined as the science of self/non-self discrimination (Howes, 1998; Tauber, 2002); the latter has inspired various forms of organic essentialism. Judged by its media presence, the genetic self looks like the strongest competitor of the cerebral subject. The genome might have indeed become a modern metaphor for the soul (Nelkin and Lindee, 1995; Mauron, 2001). But the 'neural aspects of human nature' seem more directly relevant to many of the philosophical and ethical questions, notably those related to self, raised by the western philosophical tradition, and by genetics and genomics as well (Mauron, 2003: 240). Some of the reasons for this precedence are purely empirical (e.g. genomes are replicable, brains are not), others more philosophical (e.g. since genetic influences on personality and behavior must be mediated by the brain, brain determinism cannot be refuted by pointing to other causally contributing factors, such as the environment). In a *longue durée* perspective, there is also the very history of the 'modern self'.

In such a perspective, I will argue, the cerebral subject is the anthropological figure inherent to modernity. While it would take more than an article

to support in detail such a thesis, I want to suggest that it makes both historical and conceptual sense. The history of the notoriously elastic phenomenon of 'modernity' includes the 17th-century rise of a new concept of selfhood. I refer specifically to the notion of a 'punctual', 'detached' and autonomous self, having self-awareness as its only constitutive property, and characterized by radical reflexivity, self-distancing, a sense of inwardness, a first-person standpoint, and disengagement from body and world (Taylor, 1989). Related to the 'modern self' thus characterized is the idea of 'possessive individualism' – a conception of the individual, according to C. B. Macpherson (1962: 3), 'as essentially the proprietor of his own person or capacities, owing nothing to society for them'. John Locke gave this idea its founding formula when, in the *Second Treatise of Government* (1690: § 27), he wrote that 'every Man has a Property in his own Person'. But what is 'person'?

To the extent that Locke himself, in a revolutionary move, redefined 'person' as a continuity of memory and consciousness, each individual's absolutely inalienable self-ownership could in principle be attached to any substance. In practice, however, it was necessarily located in the brain as organ responsible for the functions with which the self was identified. By an intellectual mechanism involving both transitivity and metonymy – from self-functions to brain, from the part to the whole – the self and the brain became consubstantial. The individualism characteristic of western and westernized societies, the supreme value given to the individual as autonomous agent of choice and initiative, and the corresponding emphasis on interiority at the expense of social bonds and contexts, are sustained by the brainhood ideology and reproduced by neurocultural discourses (Ehrenberg, 2008).

Moreover, whether ontological or methodological, the belief in brain-self consubstantiality seems to have impelled brain research. The idea that 'we are our brains' is not a corollary of neuroscientific advances, but a prerequisite of neuroscientific investigation. This is not a normative, but a historical, observation that makes sense of brainhood without justifying it or lending it support as an ideology of the self. In this article, I wish to remain primarily at that level, sketching one possible history of the cerebral subject, as well as its topography in contemporary society.

HOPING FOR THE BREAKTHROUGHS

The 1990s were proclaimed the 'Decade of the Brain', and although the American Psychological Association has launched a 'Decade of Behavior', the 21st century has been heralded as the 'Century of the Brain'.[3] As in the late 1890s, when the eminent German neuroscientist Oskar Vogt declared that investigating brain anatomy and physiology would be one of the most important tasks of the approaching century, brain research is today commonly presented as the chief biomedical frontier. Now as then, it is considered of

crucial import not only for individual and public health, but more generally for views of the human being and the future of humanity. Beyond its promised medical benefits, the 'revolution in brain science' is said to challenge 'social values concerning personal autonomy and rights, and for some observers raises the specter of mind control and an Orwellian-type society' (Blank, 1999: 3).

Knowledge of brain structure and development, the interactions of the neurosciences with genetics and molecular biology, the possibilities of neurochemical and surgical intervention (including such debated techniques as neural grafting and fetal tissue transplantation), all give rise to hopes for major advances in screening, diagnosis and therapy. They also inspire the futuristic optimism of the tenets of 'neurotechnology', and their anticipations that highly specific 'neuroceticals' will, in the name of 'cognitive liberty', eventually allow the citizens of the coming 'neurosociety' to further their individual 'neuro-competitive advantage' (Lynch, 2004a, 2004b).

At the same time, the neurosciences are said to renew issues of free will, authenticity and individual responsibility, to generate value changes in many areas of public interest, from law to education or from public health to taxation, and to transform societal attitudes towards phenomena such as violence, addiction, learning, or sexual differences and orientation. Several major initiatives reveal a sense of urgency about the ethical, political, legal and social consequences of the neurosciences at all levels of society. The extremely rapid professional and institutional consolidation, since the early 2000s, of the energetically self-promoting field of neuroethics may be one of the strongest signs of brainhood's dominating presence. The main goal of neuroethics is 'to investigate the implications of our mechanistic understanding of brain function for society' (Roskies, 2002: 21), to understand, anticipate and examine the ethical, social and legal consequences of neuroscientific knowledge and its applications (Farah, 2004; Garland, 2004; Illes, 2005; Marcus, 2004). Military research, drug-control policy, technologies of the self (e.g. the use of neuropharmacological 'cognitive enhancers'), the limits of privacy (e.g. the possible usages of 'brain fingerprinting'), the administration of justice (e.g. the admissibility of brain scans in lawcourts), the twin pressures to perform and to conform – these are among the issues neuroethics intends to tackle.

Neuroethics, however, has so far thrived on hype, and has, to varying degrees, tended to support those who benefit from the assumption that we are cerebral subjects, and claim that the assumption rests on neuroscientific discoveries. On the one hand, the defense of neuroethical specificity (as against making the field a branch of bioethics) is said to follow from the 'intimate connection' between brain and behavior, the 'peculiar relationship between our brains and our selves', and 'the intuition that our ever-increasing understanding of the brain mechanisms underlying diverse behaviors has unique

and potentially dramatic implications for our perspective on ethics and social justice' (Roskies, 2002: 21). On the other hand, it is asserted that, as the neurosciences advance our understanding of the brain and suggest ways for altering it, they redefine 'our sense of selfhood and brain–body relations' (Wolpe, 2002: 8).

But do they? The emerging *neuro* disciplines (to which we return below) owe their existence to imaging technologies said to uncover the 'neural correlates' of behaviors and mental states. By proclaiming that the application of such technologies in traditionally 'human science' domains gives novel forms to old philosophical questions and raises unprecedented ethical, social and legal issues, neuroethics overstates neuroscientific findings, legimitizes the *neuro* disciplines, and places itself at the forefront of a research field described as having led 'to bold new findings and claims about behavior in health and disease' (Illes and Racine, 2005: 6). That such claims are so widely believed and publicized when there is so little evidence for them is a fascinating testimony to the power of the brainhood ideology. The senses in which they might be bold and new are not generally specified; and when a sense *is* suggested, its ethical or epistemological significance turns out to be tame and antiquated.

That the announcements of unprecedented transformations in the concept of the human are little more than hot air is nicely illustrated by what neurocultural celebrities report 'on how learning about their brains changed the way they live' (see Bibliography under 'Brain Lessons'). Thanks to the neurosciences, eliminative neurophilosopher Patricia Churchland now understands 'how many differences in capacities and temperament and behavior are rooted in basic brain differences', and that has made her 'less judgmental, more moderate'. New York University neuroscientist Joseph LeDoux, author of *The Emotional Brain* and *The Synaptic Self*, has learned 'that anxiety and stress breed anxiety and stress. So, it makes sense that we should do things to reduce anxiety and stress in our daily lives.' His MIT colleague Earl K. Miller, who is at the forefront of research on the neural bases of high-level cognitive functions, has in turn realized 'that the brain has a very limited capacity to attend to multiple things. . . . So', he reports, 'on the few occasions that I drive, I never answer the phone or e-mails.' The effects of neuroscientific insights on the life of star cognitive psychologist Steven Pinker, one of *Time*'s 2004 '100 Most Influential People in the World', have been just as insignificant: 'When I have to write down a number, I make it a point to say it to myself, to use the brain's echo chamber as an auxiliary memory'; 'When I listen to music, I attend to the note-by-note transitions and how they help me segregate the instruments. And when I find myself taking umbrage at a critical remark, I try to distinguish actual unfairness from my own self-deception and self-serving biases.' Could such statements be expressions of the anthropological sea-change these luminaries expect from contemporary neurosciences?

Inflated claims and a revolutionary rhetoric have an obvious self-serving function, sustaining the cerebral subject ideology, and reinforcing the alliance between the norms and ideals of individualistic autonomy and self-reliance on the one hand, and on the other hand the prestige of the advanced technology supposed to demonstrate that we are our brains.

Neuroethics provides a good example: as has been rightly noted, its anxieties 'have become part of the very problem they seek to address' (Singh and Rose, 2006: 100; Ortega and Vidal, in press). With their ambivalent amalgam of confident expectations and alarmist caution, such anxieties also convey notions about science that justify them. Going entirely along with the neuroscientists, neuroethicists seem to consider the sciences as *having* 'social implications' or an 'impact' on society, rather than as *being* themselves intrinsically social activities that prosper largely through strategies embedded in the social fabric; this view reproduces the belief that humans have a biological self on which culture and intersubjectivity are somehow tacked. Neuroethical solicitude nurtures this view, and replicates some of the neurosciences' academic-public rhetoric, which itself imitates that of such successful scientific areas as molecular biology.

Neurocultural discourses, and neuroethics with them, mask the continuity that exists, since the early 19th century, in the main assumptions, in the 'big' questions being asked (about the nature of consciousness or the mind–brain relation), and in the answers to them as well (e.g. mind as reducible to brain or mind as an emergent property). The claim that the 1990s were declared the Decade of the Brain because 'the success of the scientific method partially replaced older notions of the soul or mind–body dualism with the doctrine that mind . . . is the brain's exclusive output' (Lepore, 2001) is typical of the ahistorical triumphalism characteristic of the *neuro* field.[4] The 'Manifesto' published in 2004 by 11 leading neuroscientists on the present state and future tasks and prospects of brain research is in this regard equally revealing (see 'Das Manifest').

On the one hand, the 'Manifesto' celebrates as insights of modern neuroscience convictions that predate the availability of minimally reliable neuroscientific data (e.g. that all psychological phenomena can be in principle explained through physico-chemical processes, or that mind and consciousness emerged in the course of evolution). On the other hand, it depicts the middle level of brain activity (the neuronal networks situated between the level of molecules and single cells, and the level of large brain areas) as the great lacuna of neuroscientific knowledge – a lacuna which calls for the equivalent of a quantum physics that would provide a unified theory of the brain. Such theory, which will have to deal with 'hard' questions about knowledge, consciousness and self-experience, is likely to arise, '[f]or in this future moment, the brain seriously gets ready to know itself' ('Das Manifest', 2004: 37).[5] Although the 'Manifesto' announces an intensive dialogue between the

human and the brain sciences, and claims that neuroscientific progress will not end with the triumph of 'neuronal reductionism', its personification of brain functions operates a double reduction of persons to brains, and of social and psychological knowledge to neuroscientific information.

THE SELF BEFORE BRAINHOOD

Brainhood seems to be an exclusively western phenomenon, albeit now universally exported through the globalization of originally European forms of science and medicine. As far as I can tell, no other culture has proposed the reducibility of self to an organ of the body.[6] But 'western culture' is a dynamic process that includes the very notion of self, and the emergence of brainhood is part and parcel of the history of views about selfhood.

The ideas of self and body are in western philosophy inextricably related; whether positively or negatively conjugated, one does not exist without the other. The notion of *self* or *I* that concerns us here crystallized in systems that distanced self and body in such a way that the body is existentially or experientially significant, yet ontologically derivative. Correlatively, being an *I* or having a *self* has been equated with consciousness and self-awareness. From a phenomenological point of view, our physical makeup certainly limits the range of possible human experiences of the world. The body may well be 'that without which we could not possibly have any experience of even the least significance' (Todes, 1993: 263), but its relationship to the self is nonetheless open to interpretation and historical transformation.

In the Aristotelian frameworks that largely dominated western scholarly thought from the 13th to the 17th centuries, the soul was a principle of life, or that which animated potentially live matter. In Aristotle's analogy (*De Anima*, 412a–13a), if the eye was an animal, then sight would be its soul. Soul was therefore responsible for the basic functions of living beings – faculties or powers known as nutritive or vegetative, perceptive or sensible, appetitive or desiderative, motor or locomotive, and rational or intellective (Michael, 2000). Possession of these faculties defined a hierarchy of being: the human soul had all of them, non-human animals lacked a rational soul, and plants had only a vegetative soul. Yet all were 'animals' or ensouled bodies, and that is why the word 'psychology' (in use by 1590) originally designated the generic science of living beings (Vidal, 2006b).

When the Aristotelian frameworks disintegrated in the 17th century, the soul ceased to be responsible for organic functions, and, as in René Descartes's philosophy, became equal to the mind. Even though this was a radical transformation of the concept of soul, the interaction of soul and body remained understood through the humoral theory derived from Galen, a 2nd-century Greek philosopher and physician (Temkin, 1973). In the Galenic system, the

four bodily humors (blood, yellow bile, black bile, phlegm) were made up of mixtures of the four elements (air, fire, earth, water), and shared in their basic qualities (warm and humid, warm and dry, cold and dry, cold and humid). The 'temperaments', or proportions and mixtures of the humors, dictated individual temperaments, in the sense of 'characters' (respectively the sanguine, choleric, melancholic, phlegmatic). Physiology thus elucidated someone's personality and aptitudes; at the same time, it explained soul–body interactions in general.

According to Galen, as the blood passed through various organs, it was transformed into 'spirits' (*pneumata*), or increasingly subtile and thin fluids. It first became a 'natural spirit', responsible for nutrition and growth. After combining with air in the lungs, it passed into the heart, where a portion was transformed into the 'vital spirit' on which motor and vital functions depended. The final refinement took place in the cerebral ventricles with the formation of the 'animal spirits' necessary for sensitive and intellectual functions. The qualities of these spirits, such as their temperature, humidity or density, followed those of the humors. For example, if a person's blood was too cold, the animal spirits would also be cold, and the dependent mental acts would be correspondingly weak and slow.

The animal spirits were believed to reside in and move among the brain ventricles, which thus operated as the seat of mental faculties. From front to back of the head, these were the 'common sense' where sensory information was collected, the imagination and fantasy, the judgment and intellect, and memory (Clarke and Dewhurst, 1972; Harvey, 1975; Kemp, 1990). The brain therefore functioned as a factory and storehouse of the animal spirits, and Galen considered it the *hegemonikon* precisely because of the role of the ventricles in transforming the vital *pneuma* into those spirits (Rocca, 2003). Yet it was the qualities of the animal spirits themselves, together with the rest of the humors, that determined a person's character; personality and psychological differences depended on them, not on the mass of tissue that makes up the brain as an anatomical structure.

ORIGINS OF BRAINHOOD

The breakdown of the Aristotelianisms included the reduction of soul to mind, and its consequent localization in the brain. The 'seat of the soul' was not the place where the soul was supposed to reside materially, but the organ where it interacted with the body. Descartes, in several letters as well as in his *Treatise of Man* (written before 1637) and *The Passions of the Soul* (1649), explained that the soul exerted its functions 'immediately' at or through the pineal gland. In contrast, the English anatomist and physician Thomas Willis proposed in *Cerebri anatome* (1664) a distributed localization of the faculties.

For both, however, the animal spirits retained their functional significance: they either moved and were moved by the pineal gland, or they circulated among various brain areas.[7] At the same time, Willis and Descartes located the seat of the soul in structures that had more consistency and materiality than the hollow reservoirs of the humors. Their theories stimulated empirical research and a lively localization debate that lasted until the late 18th century.

The quest for a seat of the soul did not lead to any reliable anatomical conclusion, but reinforced the assumption that self was dependent on the brain alone, a dependence that extended to the point of quasi-consubstantiality. This was indeed an assumption because, in spite of Willis's contributions to brain and nerve anatomy, the first identifiable formulation of brainhood derived (as far as I can tell) less from neuroscientific discoveries, than from a combination of Locke's theory of personal identity and the corpuscular theory of matter. Corpuscularianism explained natural phenomena by the size, local motion, shape and contrivance of microscopic corpuscles of matter (Eaton, 2005). Differences among physical bodies no longer originated in the essential nature of their substance, but in the 'mechanical affections' (MA) of a body's component particles. Consequently, body A at time [1] did not need to be made of the same matter as body A at time [2] in order to be the same; rather, $A_{[1]} = A_{[2]} \Leftrightarrow MA_{[1]} = MA_{[2]}$. Material continuity thus lost its importance as a constitutive element of the identity and sameness of material bodies; and this, as Locke realized, applied also to persons as well as to the very definition of personhood.

In a radical philosophical innovation introduced in the second edition of his *Essay Concerning Human Understanding* (1694: book 2, ch. 27), Locke separated substance and personal identity. The identity of the *man*, he wrote, consists in 'a participation of the same continued life, in succession vitally united to the same organized body' (§ 6). The *person*, in contrast, is 'a thinking being, that has reason and reflection, and can consider itself as itself, the same thinking thing, in different times and places' (§ 9). Thus, if the soul of a prince, containing the consciousness of the prince's past life, is transferred into a cobbler's soulless body, then the being who resembles the cobbler would in fact be the prince (§ 15). In Locke's view, personal identity requires the capacity to recognize one's actions and accept responsibility for them. This capacity necessitates the continuity of memory and consciousness, which the philosopher identified to 'the sameness of a rational being'. It follows that 'as far as this consciousness can be extended backwards to any past action or thought, so far reaches the identity of that person' (§ 9). In other words, personal identity depends exclusively on the 'same consciousness that makes a man be himself to himself', regardless of the substances to which it might be 'annexed' (§ 10).

The desubstantialization and psychologization of personhood is expressed in yet another one of Locke's puzzle cases. If my consciousness is located in

my little finger, and this finger were cut off my hand, then, the philosopher claimed, 'it is evident the little finger would be the person, the same person; and self then would have nothing to do with the rest of the body' (§ 17). Bodies become things we have, not things we are; personal identity becomes purely psychological, and distinct from bodily identity. From the standpoint of ontological theory, and in comparison with the earlier insistence on the essential corporality of the self, the Lockean theory implied a loss of body.[8] In practice, however, disincarnation could not be complete.

Although Locke thought-experimented with a conscious little finger or a cobbler's body with a prince's soul, he knew it was the nerves that conveyed sensory informations 'to their Audience in the Brain, the mind's Presence-room' (*Essay*: 2.3.1). Some later authors were more explicit as to the brain's role, and emphasized the union of soul and brain as requirement for personal identity. Thus, in his *Essai analytique sur les facultés de l'âme* [Analytical Essay on the Faculties of the Soul] (1760: § 771), the Genevan naturalist and philosopher Charles Bonnet wrote: 'If a Huron's soul could have inherited Montesquieu's brain, Montesquieu would still create' [*Si l'Ame d'un Huron eut pu hériter du Cerveau de Montesquieu, Montesquieu créeroit encore*]. The native North American stands here as paradigm of the savage; yet if his *soul* were joined to Montesquieu's *brain*, then one of the Enlightenment's greatest thinkers would still create. It does not matter that the soul and body are a Huron's, provided the brain is the philosopher's own.

TOWARDS MODERN BRAINHOOD

Bonnet's statement can be read as an early formulation of brainhood, as a sign of the emergence, in the mid-18th century, of the anthropological belief that led to Gazzaniga's and many of his colleagues' self-confident claim that we are our brains. A good number of 20th- and 21st-century neuroscientists seem to think that their convictions about the self are based on neuroscientific data. In fact, things happened the other way around: brainhood predated reliable neuroscientific discoveries, and constituted a motivating factor of the research that, in turn, legitimized it. Thus, even though the rise of the cerebral subject is irreducible to the history of the brain sciences, any attempt to understand how it became a central figure of modernity must give this history a central role. Here, I can do no more than sketchily mention some relevant developments.[9]

A major feature of brain anatomical and physiological research between the end of the 17th and the beginning of the 19th century was its link to investigations on the structure and function of the sense organs (Mazzolini, 1991). Sense organs were considered the source of all knowledge about the external world. Hence the importance of understanding their innervation,

and identifying the brain areas in which sensory nerves originated. The nerves linked the external world and the brain as much as they united the soul and the body; these functions explain their broad cultural significance during the Enlightenment, and the fact that the nervous system became the common ontological matrix of the sciences of the body and the sciences of the mind (Figlio, 1975; Rousseau, 1991; Vidal, 2006b).

At the same time, the 18th century saw the demise of the quest for the seat of the soul. Because, contrary to matter, the soul was defined as 'simple' and indivisible, many believed the seat of the soul must be a discrete point inside the brain where the nerves converged. Research, however, was so inconclusive, that the Swiss anatomist and physiologist Albrecht von Haller (1771), a convinced Christian who placed the seat of the soul globally in the white encephalic matter, observed that, though 'philosophy favors a single organ' as seat of the soul, 'it is certain that anatomy says nothing on the question'. For him, the obstacle lay chiefly in the difficulty of making brain dissections and artifically provoked brain lesions. In contrast, the mathematician Jean d'Alembert, co-editor with Diderot of the French *Encyclopédie*, considered the quest for the seat of the soul as 'one of the chimeras of ancient and modern philosophy' (D'Alembert, 1986[1767]: 273).

Nineteenth-century brain research fulfilled both d'Alembert's and Haller's desiderata: on the one hand, it abandoned the concept of soul and the search for its organ or seat; on the other, it evolved towards increasing technical, descriptive and argumentative sophistication and precision. The bond of brain to self and personhood was thereby confirmed and refined. An early and familiar example is that of phrenology (Clarke and Jacyna, 1987; Renneville, 2000). Based on the theories of the Viennese physician Franz Joseph Gall, the hugely popular phrenology assumed that the brain is the organ of the mind; that the mind is composed of innate faculties; that each faculty has its own brain 'organ'; that the size of each organ is proportional to the strength of the corresponding faculty, and that the brain is shaped by their differential growth; finally, that since the skull owes its form to the underlying brain, its 'bumps' reveal psychological aptitudes and tendencies. As in the case of Montesquieu and the Huron, personal, racial and gender identity are predicated upon features of the brain.

That the 'organs' were also imaginary was not phrenology's main problem. Jean Pierre Flourens, who pioneered the use of experimental lesions to study brain function and whose work held sway for decades, dedicated his often-reprinted *Examen de la phrénologie* [Phrenology Examined] (1842) to the memory of Descartes. For him, Gall's doctrine boiled down to two propositions: that the understanding resides only in the brain, and that each of its faculties has its own brain organ. For Flourens, the first proposition (lately proclaimed a novel 'astonishing hypothesis', Crick, 1994) stated nothing new, and the second, 'perhaps nothing true'. By dividing up the mind in a myriad

localized faculties, Gall, in Flourens's opinion, destroyed the unity of the self. Now, Flourens argued, if there is no *I*, then there is no soul; and the abolition of the soul implies that of free will, morals, belief in immortality, and even the idea of God. Moreover, in experiments where he gradually ablated portions of the brain from living animals, Flourens found no evidence that specific cortical areas corresponded to different functions; rather, he observed a correspondingly gradual weakening of all functions simultaneously. He inferred that the brain operates as a unity, and that each function involves several areas.

Phrenology was nonetheless the first system to anchor psychological qualities and behavior in localized regions of the cerebral cortex, and some of its premisses were confirmed by experimental and anatomo-clinical research in the second half of the 19th century. The opposition of Gall and Flourens illustrates the fluctuation between localizationism and holism, a fluctuation that seems inherent to brain research and especially to thinking about the relation of brain and self, but which also embodies broader cultural and societal tensions (Harrington, 1999).

LOCALIZATION AND THE DEMISE OF PHRENOLOGY

Nineteenth-century experimental psychophysiology and pathological anatomy simultaneously gave impulse to the localization project, and contributed to the ruling out of phrenology as a legitimate approach. While phrenology correlated behavior or dispositions with cranial shape, which it occasionally checked against cerebral morphology, the anatomo-clinical method searched for correlations between symptoms and brain lesions. Such methodological orientation was shared by the partisans of discrete loci of mental faculties, and those who insisted on the unity of intelligence and the integrated nature of brain action. The case of 'Tan', an aphasic patient studied in the late 1850s by French anatomist and physical anthropologist Paul Pierre Broca, is paradigmatic of the anatomo-pathological method and of mid-19th-century localization debates.

'Tan, tan' – such was, accompanied by hand gestures, Monsieur Leborgne's response to whatever question he was asked. The patient's clinical history and the post-mortem study of his brain led Broca to conclude that the faculty of articulate language was possibly located in the second or third frontal convolution. It was clear to Broca that the higher 'brain faculties', such as judgment, reflection, comparison and abstraction, had their seat in the frontal lobes, whereas feelings, inclinations and passions depended on the temporal, parietal and occipital lobes. Broca (1861: 338) recognized 'that the major areas of the mind correspond to major areas of the brain', but found that

differences in the localization of lesions inducing loss of articulate language were incompatible with the phrenological *système des bosses*, yet consistent with the 'system of localizations by convolutions'.

Moreover, Broca's demonstration of the unilateral localization of language (in the left hemisphere) opened the way to the formulation of hemispheric dichotomies (Harrington, 1987, 1991). The left hemisphere ended up associated with humanness, masculinity and rationality, with their powers of will, intelligence, consciousness and reason, the right one with 'animality', femininity and the emotions. Research on hemispheric lateralization and dominance has since translated into a vast personal development and self-help literature for cultivating one side of the brain, and even into neuropolitical considerations about the catastrophic future of a society that would be tyrannized by left-hemisphere values (Harrington and Oepen, 1989).

For 19th-century British and German brain scientists, the method of correlating clinical and pathological phenomena was suspiciously reminiscent of the craniological approach (Young, 1990: 148). Few, however, would have denied that the brains of geniuses, criminals and the mentally ill contained, somehow inscribed in their fleshy substance, the extraordinary positive or negative qualities of their owners. This brand of localizationism, with its galleries of exceptional individuals and its collections of preserved brains, matched the 19th-century development of physiognomic, cranial and bodily typologies; closely related to craniometry, the measurement of differences in brain weight and size dates back to the early days of physical and racial anthropology, and was a truly international fad (Gould, 1981; Podgorny, 2005).

Beyond national differences, to know the brain was to know what its parts did and were responsible for; the localizationist style of thinking was widespread. At the end of a century he celebrated as 'wonderful', Alfred Russell Wallace (1899: ch. 16) still regretted the 'neglect of phrenology' – a science, he said, whose 'substantial truth and vast importance' could not be questioned; a science whose founder was said to have discovered, among other 'universally admitted' facts, 'that the brain is the organ of the mind' (ibid.: 160).

FROM CORTICAL MAPS TO NEUROPLASTICITY

By the late 19th century, cerebral localization, differentiation of function, and the correlation of site and effect, structure and function, had become investigative principles. They resulted in ever increasingly detailed anatomical and cyto-architectonic maps of the cerebral cortex that assigned distinct functions to discrete cortical regions.

In the 20th century, clinical and experimental methods came together; the pioneering work of the Americans Wilder Penfield and Roger Sperry is one of the best known instances. In the 1950s, as a neurosurgeon treating epileptics,

Penfield knew that before a seizure, patients experience an 'aura'. If he could artificially provoke the aura by electrically stimulating the brain, he could determine the source of the seizure, and remove the tissue. His 'Montreal Procedure' was an open-skull surgery in which the surgeon probed sections of the brain, and the patient reported his or her feelings. Penfield thus mapped areas corresponding to motor and sensory functions, as represented by the well-known 'homunculus', or miniature human being whose features are drawn proportionally to the associated brain areas (Penfield and Rasmussen, 1950). No introductory psychology textbook fails to reproduce the homunculus; and in 'Spock's Brain' (a *Star Trek* episode of 1968), Spock himself directs the reattachment of his stolen brain to his body as if he were a Penfield patient responding to stimulation.

A second area of research that should be foregrounded for its scientific impact, the spectacular nature of its results, and their subsequent presence in textbooks and the media, concerns split-brain and complementary hemispheric specialization. Again as a treatment of epilepsy, surgeons separated patients' hemispheres by cutting the corpus callosum. Starting in the 1960s, Sperry and others studied such patients. Since information from each visual field (i.e. the right or left half of what each eye sees) is sent to the opposite side of the brain, patients shown an image in the left visual field cannot name or talk about what they see (the image arrives only on the right side of the brain, and speech is, in most people, controlled by areas on the left). But they can pick up the corresponding object with the left hand, which is controlled by the right side of the brain. The same happens with touch, smell or sound stimulation. Split-brain research gave support to the idea that the brain is organized in a modular manner, and inspired both studies reaching into the areas of consciousness and brain plasticity, and philosophical discussions of the implications of commisurotomy for personal identity (e.g. Puccetti, 1973).

Starting in the 1950s, cybernetics provided abstract models of brain neurophysiology; a decade later, artificial intelligence and cognitive science fostered the brain-as-computer paradigm. Circuit diagrams and flow charts became tools for thinking about brain structure and function. Nevertheless, localizationist determinism never lost its appeal. Why else, for example, would the brain of Ulrike Meinhof, a German Red Army Faction leader, have been removed from her body after she committed suicide in prison in 1976? The brain itself, however, was examined only in the late 1990s, at a time when imaging techniques had contributed to revive morphological localizationism. A psychiatrist then discovered lesions caused by a 1962 operation, and concluded: 'The slide into terror can be explained by the brain illness' (Anonymous, 2002).

The saga of Albert Einstein's brain may be extreme, yet emblematic of how technology may update beliefs without changing them. After the physicist's death in 1955, pathologist Thomas Harvey cut his brain into 240 cube-shaped

blocks from which microscopic slides were prepared; like relics of a medieval saint, some of these pieces and slides were sent over the years to devotees around the world. Thirty years later, a contested but well publicized histological analysis claimed that the left inferior parietal area of Einstein's brain contained more glial cells per neuron than the average (Diamond *et al*., 1985). A 1996 article described Einstein's cortex as thinner and more densely populated with neurons than control brains; a few years later, an equally disputed study stated that in the posterior end of the Sylvian fissure, Einstein's brain is 15 per cent wider than controls (the parietal lobes were singled out for study because neuroimaging techniques had allegedly confirmed that these areas are responsible for mathematical reasoning, as well as for visual and three-dimensional representation; Witelson *et al*., 1999). In the meantime (1994), the BBC produced Kevin Hull's hilarious documentary *Einstein's Brain*, about Japanese Einstein-worshipper Kenji Sugimoto's quest for a piece of the genius's brain.[10]

The relic status of 'elite brains' was by then nothing new (Hagner, 2004); after Lenin's death in 1924, Oskar Vogt had sliced his brain more finely than Harvey did Einstein's. Since brain forms are unique and there is no way of correlating form and function on the basis of a dead person's preserved brain, such research must remain inconclusive. Nevertheless, while the remains of Einstein's brain can be examined only histologically, some scientists hope that imaging techniques will confirm their results (basically, that more and bigger is better), and reveal the neuroanatomical and neurofunctional substrates of intelligence. The continuity with much earlier localizationist approaches persists even among relative skeptics. Thus, explains a neuro-ophthalmologist, while Einstein's brain by itself might not reveal much, 'before we consign Einstein's intellect to the realm of the unknowable or blindly rever his brain as a sacred talisman, we must recall that neuroscience is still a young discipline', and that, '[e]ven if we have the right questions, we must have adequate technology to provide the right answers' (Lepore, 2001). At work here is the well-established stratagem of simultaneously appealing to temporary ignorance and disciplinary youth.

In short, from 19th-century phrenologists palpating head bumps, through EEGs starting in the 1930s and up to today's brain scans, the hope of being able to read the mind and the self through brain recordings has not subsided (Borck, 2005; Uttal, 2001). As Hagner and Borck (2001: 508) observed, the late 20th-century comeback of the cerebral localization of mental aptitudes and inclinations 'is due to a cohabitation of new visualization techniques with old psychological parameters'.[11] At the same time, these techniques confirm the anatomical, functional and developmental evidence that the brain is neither a mosaic of punctate sites, nor a hard-wired collection of neuronal circuits, but an array of interconnected and parallel networks, highly plastic and capable of developing and repairing itself.

Cognitive functions, in particular, turn out to be dispersed in various cortical areas, and the networks that represent them seem highly mobile, both functionally and anatomically. This does not invalidate complex forms of the localizationist approach (Zawidzki and Bechtel, 2005), but has come hand in hand with a new neurocultural keyword: 'neuroplasticity'. In general audience works such as *The Creating Brain: The Neuroscience of Genius* or *Brave New Brain: Conquering Mental Illness in the Era of the Genome*, both by prominent neuroscientist Nancy Andreasen, neuroplasticity is the basis of creativity and therapy. For Canadian psychiatrist Norman Doidge (2007: xv) in his bestseller *The Brain that Changes Itself*, it is 'one of the most extraordinary discoveries of the twentieth century' – one that seems to demonstrate that the mind indeed alters the brain.[12] In 2003, conceptual artist Jonathon Keats copyrighted his brain as a sculpture created thought by thought (Singel, 2003); the following year, a book claiming that 'humans make their own brain, but they don't know it' repeatedly linked neuroplasticity to our 'sculpting' our brains (Malabout, 2004); and the 'neurobics' industry, with its slogan 'Change your brain, change your life', has effectively incorporated the idea into its marketing strategies for brain fitness (e.g. www.sharpbrains.com/tag/neuroplasticity or the Brain Fitness Channel, http://bfc.positscience.com/).[13] The point here is not to scorn scientific accomplishments or deride therapeutic hopes, but rather to highlight the capacity of neurocultures to prey on the most diverse pieces of evidence and the most varied beliefs in order to feed the ideology of brainhood.

THE SITUATION TODAY

In the 1960s, philosophers of the English-speaking analytical tradition started discussing personal identity with the help of puzzle-cases, thereby reviving the Lockean approach. The protagonists of the new philosophical fictions, however, were no longer Locke's soulless bodies or an arbitrarily localized consciousness, but out-of-body brains, generally waiting to be grafted onto some body. These 'ectobrain' thought-experiments were commonplace in earlier science fiction stories and movies (Vidal, in press). But their appearance in academia may have signalled the crystallization of brainhood as a biosocial norm, or at least a point when the idea of the human as cerebral subject came to function as a spontaneous view across a wide spectrum of social settings, from popular culture to professional philosophy.

As far as I can tell, the first instance can be found in Cornell University philosopher Sidney Shoemaker's *Self-Knowledge and Self-Identity* (1963). Shoemaker imagined that a brain can be entirely removed from a person's skull to be repaired, and then be put back in the skull. One day, a surgeon's assistant interchanges Mr Brown's brain and Mr Robinson's brain. One dies

immediately, but the other survives. Endowed with Robinson's body and Brown's brain, 'Brownson' declares that his body is Robinson's corpse lying on a nearby bed. Yet as far as his personality, biography and social relations are concerned, he is just like Brown. So far the thought experiment.

Shoemaker noted that even if we say that Brownson *is* Brown, brain identity is not really the criterion of personal identity. Indeed, if Brownson acted like Robinson, nobody would say that he *must* be Brown because he has Brown's brain. The relationship between brain and personality is not logically necessary, but only 'causal and contingent'. Although Brownson's having Brown's brain explains his psychological affinity to Brown, it does not follow that Brownson is Brown. Or if we say so, then we allow psychological criteria of personal identity to override 'the fact of bodily nonidentity' (Shoemaker, 1963: 24–5). Although Shoemaker here seems to have neglected the fact that the brain is part of the body, his reasoning anticipated in the realm of academic philosophy the dichotomy body–brain that has since become the constitutive trope of neurobics, as well as of many media treatments of the neurosciences: 'Brain not Body Makes Athletes Feel Tired' (Randerson, 2004).

Ostensibly bodily conditions, such as pain or obesity, which can be in part neuropharmacologically managed, have been the object of similar statements, and illustrate the personification of the brain which has become one of the most powerful mechanisms for the perpetuation of the cerebral subject. Embodied in countless statements declaring that the brain decides, learns and loves, or even that brains, rather than persons, understand each other, personification relies on an ontological reversal such that 'You are your brain' becomes factual, while 'You are yourself', figurative. According to Vilayanur Ramachandran, high-profile neuroscientist at the University of California, San Diego, and one of the most cited authors of the neurocultural world, 'We used to say, metaphorically, that "I can feel another's pain." But now we know that my mirror neurons can literally feel your pain' (in Slack, 2007).

Philosophers in the 1960s did not go that far. In the wake of Shoemaker, and perhaps against the background of Penfield's findings and the Spanish Yale University physiologist José Delgado's spectacular experiments on electrical stimulation of the brain, surgical brain fictions became analytical philosophers' favorite tool for discussing personal identity (on Delgado, see Horgan, 2005). Philosophers toyed with operations of different sorts, such as bisection (and the subsequent question of whether two persons can share a single body), grafting of X's brain into Y's brainless body, or transplantation of each hemisphere into a new body (see, for example, Parfit, 1971; Puccetti, 1969, 1973; Wiggins, 1967). In this manner, the brain consensually emerged as the somatic limit of the self, so that I cease to be (myself) if I lose it by amputation.

The rise of cognitive and computational neuroscience may have reinforced philosophers' inclination to spin thought-experiments. In 1981, Douglas

Hofstadter and Daniel Dennett's popular *The Mind's I* collected the most extravagant brain fictional narratives of alleged interest for elucidating the relations of mind, body, self and personal identity. In *Philosophical Explanations*, published that same year, Robert Nozick tested his 'closest continuer theory' of personal identity through time by applying it to eight particular cases – all of them brain fiction tropes; these were: duplication; transplantation into a body eventually cloned from the original; brain pattern transferal to the blank brain of another body, again eventually cloned from yours; transplantation of half a brain and removal of half a brain, in both cases with 'full psychological similarity'; transplantation of brain halves into different bodies (a combination of the two previous figures); as you are dying, a random commingling of molecules reproduces your brain and body, in a healthier state but with 'complete psychological similarity to you'; half of an ill person's brain is transplanted into another body, but the original body plus half-brain survives for some time (Nozick, 1981: 37–47). Nozick's choice of brain fictions highlights the status of self-evidence that brainhood has gained. At the same time, the fictional nature of the cases is emphasized by the fact that Nozick did not deal with the link of brain and identity, and that 'brain' does not even appear in the index of his book.

Also in 1981, Hilary Putnam (1981: ch. 1; Gere and Gere, 2004) used 'brains in a vat' as a variation of the Cartesian demon that fools you into believing you have a body and that there is an external world. Putnam imagined that while you are sleeping, a scientist removes your brain, keeps it in a vat, and hooks it to a computer that sends the kinds of signals that usually informed your brain. When you wake up, everything looks the same as usual, only that you are, in fact, merely a brain in a vat. Putnam argued that if you were in such a situation, you could not think you were a brain in a vat. Although his goal was to discuss skepticism rather than personal identity, it is again significant that the choice of a brain fiction seemed so natural, as if investigating self-knowledge necessarily implied (at least for a thought-experiment) equating personhood and brainhood.

The questions raised in these philosophical texts have merged with the usages and media presence of brain imaging, the somatization of the self, and the critique of brainhood. Since the 1990s, the most popular imaging method has been functional magnetic resonance (fMRI), which records blood flow in the brain using changes in magnetic properties due to blood oxygenation. In industrialized nations today, brain-imaging technologies incarnate a cluster of hopes and challenges about health and performance. Moreover, they have driven the development of *neuro* fields whose common purpose is (with varying degrees of explicit reductionism) to reform the human sciences on the basis of knowledge about the brain. Neuroesthetics, neuroeconomics, neuropsychoanalysis, neurotheology, neuroeducation, neurolaw, social neuroscience and others have all emerged during the Decade of the Brain.[14]

Early fMRI research applications focused on sensory and motor functions; since 1991 there has been a steady increase in studies on topics with potential ethical legal, social and policy implications, such as attitudes, cooperation and competition, violence, or religious experience (Illes *et al*., 2003). Usages of fMRI have expanded into commercial enterprises, such as neuromarketing (whose aim is to shape advertising campaigns on the basis of what scans may reveal about how potential customers respond to publicity), or the already mentioned neurobics (which, like anti-ageing creams, is said to do no harm, and perhaps some good; Lawton, 2008).

Like research on consciousness and the brain localization of the self (see Platek *et al*., 2004, or Feinberg and Keenan, 2005 for recent examples), the *neuro* fields that thrive on the availability of fMRI are mostly about material foundations and 'neural correlates'. Neurotheology aims at investigating the neurological bases of spiritual and mystical experience; the Dalai Lama himself highly approves of western scientists' interest in the functional state of eastern meditators' brains. Similarly, neuroesthetics, neuropsychoanalysis, neuroeducation or social neuroscience describe themselves as looking for the neurobiological 'underpinnings' of the processes studied and described by esthetics, psychoanalysis, education or social psychology. Neuroeconomics, arguably the most developed of the new fields, has already made it into a major new reference work, the *Encyclopedia of Cognitive Science* (McCabe, 2003).

For all their self-promotion as pioneers of a new view of humankind, authors in these areas tend to furnish results of uncertain meaning and dubitable value. In a widely publicized study, for example, two Canadian researchers asked 15 Carmelite nuns to remember their most intense mystical experience since joining the order; they subjected them to an fMRI brain scan, compared the results to scans obtained in two other conditions, and detected differences and various loci of activation (Beauregard and Paquette, 2006). Mystical experiences, they concluded, 'are mediated by several brain regions and systems', instead of there being a 'God spot' or 'module', as previously hypothesized. This does little more than confirm that the brain functions when we think (or remember, or feel, or whatever), while teaching nothing about mystical experience. Not all studies are as flimsy as this one, but most suffer from 'brain overclaim syndrome' (Morse, 2006), and in any case share basic assumptions, questions, methods, arguments, and cultural significance. Moreover, though generally precise about their methodology, they remain notoriously vague in their use of the interpretative notions, such as 'role', 'mediation', 'foundation' or 'representation', that should make sense of their results by suggesting the connection that behaviors and brain activation patterns may have beyond statistical correlations. Even Ramachandran recently observed that '98% of brain imaging is just blindly groping in the dark' (Dingfelder, 2008: 27).

The 'discoveries' of the *neuro* fields are mainly embodied in the kinds of images that, since the 1990s, have flooded the public domain and rapidly

acquired iconic value. Those images sustain the legitimacy of the disciplines that produce them, and affect the way we understand the relation of brain to personhood. According to anthropologist of science Joseph Dumit (2004: ch. 5), the media presents them so as to objectify normality, bring about a cerebral typology, and suggest the existence of natural kinds of persons (e.g. normal, healthy, depressed, handicapped). In popular accounts, but also in much of the *neuro* research mentioned above, images are offered as immediate proof that people are different because their brains are different. Functional neuroimages thus seem to provide visual diagnoses, and tell us why we are the way we are. Their dynamic pop-art beauty, intuitive appeal and apparent legibility have contributed to turn them into pictures of the self at the expense of public awareness that they result from complex processing of computer data, and could look totally different.

Brain-imaging specialists are in this respect ambivalent (Joyce, 2005). On the one hand, they criticize popular presentations of fMRI, and treat images as a byproduct of research, as visualized numbers with no mimetic value; on the other hand, as in most public discourse about scans, they personify the technique, and identify the images with transparency, objectivity and progress. They thus blur the distinction between machine and image, and implicitly attribute to MRI itself the capacity to speak, reveal, produce and express knowledge. But by objectifying illness, such reading of brain images has contributed to the de-stigmatization of illness and to the fashioning of patients' identities (Dumit, 2003).

Neuroimaging does not seem to have directly played a crucial role in the emergence of the 'neurodiversity' movement (see www.neurodiversity.com and the Wikipedia article 'Neurodiversity'). Nevertheless, fMRI research such as the program conducted by UCLA developmental neuroscientist Mirella Dapretto and others (2006), which suggests that a dysfunctional mirror neuron system underlies the social deficits of autism, is known to advocates of neurodiversity and may support their demands for the acceptance of neurological pluralism. Moreover, to the extent that such pluralism implies a cerebralization of specific difference, the assertion of neurodiversity may bring about not only 'minorities' defined by local personal rights, but even a new form of ethnicity. Indeed, the quest for neurodiversity recognition has by now expanded into the new domain of 'cultural neuroscience'. Thus, Chinese investigators reported that while their compatriots use the medial prefrontal cortex to 'represent' both the self and the mother, westerners use that brain area to represent the self alone; in their view, this corresponds to cultural preferences (for an interdependent vs. an independent self respectively), and provides 'neuroimaging evidence that culture shapes the functional anatomy of self-representation' (Zhu *et al.*, 2007; for a more complex notion of cultural neuroscience, see Chiao and Ambady, 2007).

From cells to selves, the neurocultural universe seems capable of assimilating it all. How it manages, under what forms, with what consequences, are

questions that largely remain to be investigated. But that universe is not a black hole from which nothing can escape after having fallen past its event horizon. In addition to a growing body of historical, sociological and anthropological work that has been shedding considerable light on those questions, critical perspectives on brainhood have emerged within the neurosciences themselves (Choudhury, Nagel and Slaby, in press). Starting with a critique of the equation brain–body and of eliminative neuro-reductionism (according to which there are no mental, only neuronal states), Francisco Varela and his collaborators developed a 'neurophenomenology' aimed at reintegrating embodiment and the first-person experience into the neurosciences (Petitot *et al*., 2000). Varela, it is worth noting, was a practitioner of Tibetan Buddhist meditation, and a member of the Advisory Board of the Mind and Life Institute that sponsors the above-mentioned fMRI studies of meditators' brains. In a different vein, the stories beautifully told by clinical neuropsychologist Paul Broks (2003: 101) demonstrate 'that we are not only physically *embodied*, but also *embedded* in the world about us'. The self depends on the integrity of brain function, but does not exist enclosed within its biological boundaries.

Among philosophers, Paul Ricoeur noted that the cerebral fictions used to discuss personal identity neutralize the body and restrict it to the brain at the expense of the self as flesh (*soi comme chair*; Ricoeur, 1990: 378). The brain, he suggested, is different from the rest of the body in that it lacks the 'phenomenological status' other organs derive from our 'lived relation' to them (ibid.: 159). Indeed, people engaged in neurofitness may well try, as advertised, to make their brains 'feel younger' – but whatever result they obtain, it is not a feeling of brain rejuvenation inside the head; *pace* Ramachandran, *I*, and not my mirror neurons, 'feel your pain'. An especially important philosophical discussion is Kathleen Wilkes's *Real People*, where she argued for a philosophy of personal identity 'without thought-experiments', and demonstrated that the problem with brain fictions is their theoretical impossibility, their belonging to a world so different from ours that it precludes philosophically interesting conclusions (Wilkes, 1988).

THINKING WITH THE ARTS

Contemporary artists have often employed medical technologies to probe the meaning of personhood and the limits of depicted self-knowledge and representation. For example, Gary Schneider's 'Genetic Self-Portrait' (1997) is an installation of 55 photographs that enlarge microscopic pictures of tissue samples from his body, and other artists have created images from DNA samples to variously investigate genetic identity; Mona Hatoum submitted herself to an endoscopy, which she used to create the video installation 'Corps étranger' (1994); Justine Cooper's 'Self-Portrait' (1998) is a sculpture

made of MRI images of different parts of her body, mounted on clear Plexiglass sheets, stacked with space in between them and connected with steel cables. Others have confronted brainhood directly.

Keats, the artist who copyrighted his brain as a sculpture, mocked the identification of the person with the brain, of personal continuity with brain continuance. In a more introspective mode, Helen Chadwick's 'Self-Portrait' (1991), a photographic transparency mounted on glass and lit from behind, shows the artist's hands holding a brain (Chadwick, 1996; Vidal, 2005).[15] By substituting a brain for the face, the artist seemed to identify self and brain. But while the depicted organ could not be Chadwick's own, the hands, another traditional element of self-portraiture, are indeed hers, and metonymically refer to the rest of her person. Her self-portrait questions brainhood, yet at the same time places the brain at the center of her art. Starting with her experience as a patient, Susan Aldworth used brain scans to create works, such as her 2002 'Crucifix and Two Plinths', that evoke the Christian theme of the Incarnation, and explore the relationship between the self and the physical brain, consciousness and its possible location and visualization (www.susanaldworth.com). For 'Magic Forest', a walk-in slide dissolve installation tracking neuronal development and largely using images obtained through a laser confocal microscope, Andrew Carnie collaborated with a neurologist (www.tram.ndo.co.uk). For 'Slice', another installation of the same type, he was inspired by conversations with Paul Broks, whose book *Into the Silent Land* also motivated Susan Aldworth. Finally, Mariko Mori, in her interactive installation 'Wave UFO', wished to give viewers the experience 'of travelling through a connected world' by transforming their brainwaves into visual imagery that is immediately projected onto the installation's inside walls.[16] (For further *neuro* art, see Albano, Arnold and Wallace, 2002; Anker and Frazzetto, 2006.)

To be sure, these artworks are 'symptomatic of the rise of a "neuroculture", in which neuroscientific understanding becomes part of our daily life' (Frazzetto, 2008, commenting on the art show of the New York City Brainwave festival, www.brainwavenyc.org). Nevertheless, like most neuroscientists dealing with ethical or philosophical issues, artists explore questions that, in their form and content, remain anchored in post-Cartesian mindsets about the relationship of mind and body, and in even older debates about the role of the flesh in the making of personal identity. The art in question is at least as much a display of technical and scientific novelty, as a sign of the resilience of ways of thinking that the neurosciences imagine themselves to be eclipsing or liquidating. The arts reflect the extent to which the brain has become *the* self's body, while at the same time incorporating the traditional qualities of the immaterial soul; they explore this apparently incongruous situation without making clear-cut explicit choices nor searching for conclusive solutions.

The open-endedness of the arts, their resistance to saying where 'progress' might or should be, their unwillingness to bring closure to questions such as that of free will, could perhaps be taken as guidelines.[17] Their inconclusiveness does not betray vacillating or indifferent attitudes, but constitutes a positive response to the polymorphic nature of personhood and the intrinsically polysemous character of the concepts involved. The problem of representation is in this respect paradigmatic. Functional neuroimages may be modern icons, but, like Moriko's brainwave projections, they result from a chain of decisions about the processing of numerical data, and are embedded in local practices of production, reception and communication that add to their technological complexity. What does that imply for the materialization of invisible psychological qualities and experiences, and for the transformation of material processes into immateriality? What is the relation of the digital image to the object of knowledge pursued in the laboratory? In sum – and the question epitomizes the problem of brainhood – what do we see when we look at a brain scan? If they are to help us navigate the stormy 'politics of life itself' (Rose, 2007), the answers to these questions will have to avoid both reducing neuroimages to an arbitrary manipulation of numbers, and raising them to the status of portraits of the self.

NOTES

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1 It should be by now clear that the 'anthropological figure of modernity' of this article's title is the 'cerebral subject', rather than its main feature, 'brainhood'. The metonymy makes for a crisper title, and is consistent with our main point. Earlier uses of 'cerebral subject' include Vidal (2005, 2006a); for an independent and related use, see Ehrenberg (2004). 'Cerebral subject' is used in the spirit of Nikolas Rose's (2007: ch. 7) 'neurochemical self', i.e. not to designate an entity reified and attributed 'effects' and 'embodiments', but rather kinds of persons or modes of being that correspond to certain accounts of personhood by virtue not only of discourses, but also of concrete practices, such as when psychiatry gives up the distinction between organic and functional disorders, postulates that the 'mind is what the brain does' – the mantra of the brainhood ideology – and acts accordingly (see also Novas and Rose, 2000, on the related rise of 'somatic individuality').

2 For Spanish neuroscientist Francisco Mora (2007), who fully adheres to the brainhood ideology, 'neuroculture' is a new vision of humanity and society based on knowledge about the brain. I prefer the term in the plural to designate

constellations of ideas and social forms whose common denominator is the view of the human as a cerebral subject, and to emphasize the construction of different norms, values, meanings and identities through *neuro* discourses and practices. On similar usages, see *Slate* (2007) and the still-under-construction www.neuroculture.org

3 See www.decadeofbehavior.org. As far as I can tell, the Century of the Brain did not benefit from an official launching from the White House (as was the case for the Decade), but Google results testify to the spread of the designation, and several scientific voices announced it, including one in the International Brain Research Organization's *IBRO News* as early as 1994.

4 As Hagner and Borck (2001: 508) have observed, 'While the discovery of DNA and its consequences have fundamentally changed our view of life, the neurosciences seem to deal with the same old questions of the type: What is cognition? What is consciousness? . . . This oscillation between old and new, between innovative new technologies and concepts in anatomy, physiology, chemistry, clinical neurology, psychiatry, or in the computational sciences, and often surprisingly conservative opinions about the mindful brain, partly dating back to the nineteenth century, seems to be characteristic of the neurosciences in the twentieth century and, perhaps, the new century. . . . Since linking the mind to the head, brain research has frequently operated in an outspokenly futuristic mode.'

5 'Denn in diesem zukünftigen Moment schickt sich unser Gehirn ernsthaft an, sich selbst zu erkenennen.' 'Hard' alludes to what, after David Chalmers (1995), has come to be known as the 'hard problem of consciousness', i.e. explaining why we have qualitative phenomenal experiences (the problem is 'hard' because it persists even after the mechanisms involved in the performance of the relevant functions have been specified).

6 See the Japanese brain-death debate as examined by Lock (1997, 2002). In the western world, although the consensus around brain death has weakened, it still makes sense to ask whether a brain state should not define the beginning of a person's life (Sass, 1989). In other words, if neuromaturation provides biomedical indicators of personhood, then, as human persons distinct from merely living organisms, we simply exist from 'brain life' to 'brain death' (Jones, 1989, 1998).

7 Willis linked the imagination to an 'undulation' of the spirits from the center of the brain towards its circumference, and placed its seat in the corpus callosum; he made memory depend on the movement of the spirits from the periphery towards the center of the brain, therefore placing it in the cortex; and he situated sensory coordination in the corpus striatum, which received the impressions going towards the brain and was the path by which the animal spirits descended towards the extremities

8 Such psychologization of personal identity constituted a break with the Christian view of the person as an intrinsically corporeal entity (Vidal, 2002). This is something contemporary authors seem to ignore. To take only an extreme example, the French artist Orlan, most famous for the performances of 1990–93 during which she publicly underwent plastic surgery, denies that her 'Carnal Art' inherits anything from Christianity. Now, while Orlan's explorations of the status of the body maybe subvert patriarchal paradigms or beauty norms, they largely rehearse fundamental Christian themes. Similarly, it is naive, or mere

wishful thinking, to declare that 'neuroscientific anthropology' has irreversibly demolished the Christian view of human beings (Metzinger, 2005: 54), when, historically, brainhood is firmly rooted in debates integral to the Christian tradition.

9 I am indebted to excellent historical studies, notably Brazier, 1988; Breidbach, 1997; Clarke and O'Malley, 1968; Clarke and Jacyna, 1987; Corsi, 1991; Elsner and Lüer, 2000; Finger, 1994; Hagner, 1997, 2001; Harrington, 1987, 1991; Neuburger, 1981; Spillane, 1981; Young, 1990.

10 See also Paterniti (2000), an account of the author's trip across the USA with Dr Thomas Harvey, who had autopsied Einstein and kept the brain pieces, to return them to the genius's granddaughter.

11 Such 'parameters' need not be 'old'. As Hatfield (2000) demonstrates, neuroscience only provides an additional source of data about function and brain localization; knowledge or theories about function guide research on structure. Thus, as far as the study of mental functions is concerned, psychology leads the way in brain science.

12 Neuroplasticity, then, supposedly substantiates beliefs about the mind's power to bring about illness or cure (on whose history see Harrington, 2008). But since the mind is said to be what the brain does, all that is being claimed is that brain activity changes brain activity. The paradox is ignored, or exploited, by neurofitness peddlers, and seems to have escaped the neuroscientists who search to prove that meditation alters the brain.

13 *Change Your Brain, Change Your Life* is the title of one of the many books by Daniel G. Amen (2000); it reached the *New York Times* bestseller list and has been steadily reprinted since its first publication in 1999. The author is founder of the Amen Clinics (www.amenclinic.com/ac/): 'Our goal is to help as many people as we can have the best brain possible.' Amen, who uses SPECT as a diagnostic tool, thinks that presidential candidates should be given brain scans, and purports to be able to prevent or treat Alzheimer's disease, anxiety and depression, ADHD, substance abuse, autistic spectrum disorders, aggression and even marital problems. On all this neuro-quackery, in particular connection with Alzheimer's, see Burton (2008).

14 Given the huge amount of printed and online material available for each of these *neuro* fields, any reference would be no more than one among many; it therefore seemed better to omit examples, and encourage interested readers to google for illustrations.

15 For an online image of Chadwick's 'Self-Portrait', search by artist in the collection of the National Galleries of Scotland, www.nationalgalleries.org

16 See (on YouTube) Antonella Coppola's *Wave UFO a Venezia: Reazioni* (2006), a short documentary shot during the 2005 Venice Biennale.

17 I single out free will because the question has been revived by some neuroscientists' and neurophilosophers' claims about determinism. The present debate is characterized by a clash of rather predictable viewpoints (basically, compatibilism vs. incompatibilism), as well as by a sort of neuro-solipsism that disregards considerations about society and the existence of other persons, and seems incapable of imagining that free will might have something to do with social norms and practices rather than with individual brain functioning alone. For a

recent discussion (favorable to compatibilism), see Pauen (2004). For another recent expression of free will as a brainhood problem, see John Searle's 'Free Will as a Problem in Neurobiology' (in Searle, 2006).

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BIOGRAPHICAL NOTE

FERNANDO VIDAL is senior research scholar at the Max Planck Institute for the History of Science, Berlin. His latest book (2006) is *Les Sciences de l'âme, XVI^e^–XVIII^e^ siècle* (English edn forthcoming from the University of Chicago Press). He is currently preparing a cultural history of the 'cerebral subject'.

Address: Fernando Vidal, Max Planck Institute for the History of Science, Berlin, Germany. [email: vidal@mpiwg-berlin.mpg.de]