

## THE MAGNETISM OF NEUROIMAGING: FASHION, MYTH AND IDEOLOGY OF THE BRAIN

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*This article confronts the brain-centric trend invading psychology, the social sciences, the humanities and popular culture. Four points are discussed. First, it describes the power of neuroimaging and how much it can be stretched to supposedly explain human activities. Faced with its seduction, the emergence of a critical neuroscience, which examines conditions and social uses of neuroscience itself, is welcomed. In second place, the accordance between brain-centrism and individualism, together with the trend toward interiorization, are considered. The possible ideological use of the brain in the service of economic liberalism is unmasked, showing the association between "neuronal man" and "the spirit of the new capitalism." In third place, the boom in neuroscience, compared to the decline of the social sciences and humanities, is discussed. The "three cultures": natural sciences, social sciences and the humanities, each competent in its own terrain, are defended. Finally, the underlying philosophical question is posed. Philosophical materialism is offered to counter the dualism-monism loop from which neuroscience cannot escape, on the basis of an ontology of three genres which, for the case at hand, are specified as body, behaviour and culture.*

**Key words:** Brain-behaviour-culture, Cerebral plasticity, Monism, Dualism, Philosophical materialism, "Three cultures".

*El artículo confronta la tendencia cerebro-céntrica que invade la psicología, las ciencias sociales, las humanidades y la cultura popular. Se abordan cuatro puntos. En primer lugar, se muestra el poder de las neuroimágenes y lo que dan de sí como presunta explicación de las actividades humanas. Frente a su seducción, se saluda el surgimiento de una neurociencia crítica, que examina las condiciones y usos sociales de la propia neurociencia. En segundo lugar, se señala la avenencia del cerebro-centrismo con el individualismo y su tendencia interiorizante. Se desenmascara el posible uso ideológico del cerebro al servicio del liberalismo económico, señalando la asociación entre el "hombre neuronal" y el "espíritu del nuevo capitalismo". En tercer lugar, se observa el auge de la neurociencia en relación con el declive de las ciencias sociales y de las humanidades. Se reivindican las "tres culturas": ciencias naturales, sociales y humanidades, cada una competente en su terreno. Finalmente, se plantea la cuestión filosófica de fondo. Frente el bucle dualismo-monismo del que no sale la neurociencia, se ofrece el materialismo filosófico, sobre la base de una ontología de tres géneros que, para el caso, se concreta en cuerpo, conducta y cultura.*

**Palabras clave:** Cerebro-conducta-cultura, Plasticidad cerebral, Monismo, Dualismo, Materialismo filosófico, "Tres culturas".

**T**he brain has become the focus for the explanation of human affairs. Suddenly, it is as though everything depended on the brain and we were nothing more than "a pack of neurons," as Francis Crick put it in 1994, on presenting his revolutionary hypothesis for the twenty-first century, according to which "You, your joys and your sorrows, your memories and your ambitions, your sense of personal identity and free will, are in fact no more than the behaviour of a vast assembly of nerve cells and their associated molecules" (Crick, 1994, p. 3). The neuro-revolution has been declared, according to Z. Lynch (2009). The creator role of the

brain is already taken for granted, to judge from the titles of recent works by important authors, such as Michael Gazzaniga: *Human: The Science Behind What Makes Us Unique* (2008) or Antonio Damasio: *And the Brain Created Man* (2010) – practically biblical in tone.

Neuroscience has become the queen of the sciences, with the complicity of the social sciences and humanities, including philosophy. The challenge for neuroscience, argue Kandel, Schwartz and Jessell (2001), is to explain behaviour in terms of the brain, the last hurdle of this task being to understand the biological bases of consciousness and of the mental processes through which we perceive, act, learn and remember. Within this field, cognitive neuroscience is the discipline especially concerned with studying the biological mechanisms of cognition, attempting to specify psychological functions in neuronal terms.

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Cognitive neuroscience represents a growing trend in psychology (Spears, 2008). This trend consists primarily in putting psychological questions “through the neuroimaging scanner.” A 2008 special issue of *Current Directions in Psychological Science* shows how practically all the traditional topics in psychology (selective attention, short- and long-term memory, declarative memory, non-declarative memory, object recognition, conceptual system, visual system, etc.) are reconceptualized in neuroscientific terms. Although it is legitimate and interesting to study the interface between neuroscience and psychological science, what is important to emphasize here is that psychology’s remit is to understand psychological functioning, not what occurs in the brain. Psychology studies *how* the mind functions (though some might prefer to talk about behaviour), and not *where* the brain functions. As Mike Page (2006) notes, after so much investment of time and money, neuroscientific findings have yet to bring about any advances in psychological knowledge.

For its part, psychiatry, despite the plurality of schools (psychoanalytical, phenomenological, interpersonal, etc.), appears, like psychology, to be fulfilling its old aspiration of understanding mental disorders as brain disorders, reflecting the impact of neuroscience (Insel, 2009). In fact, it has been proposed to realign psychiatry with neurology, with a view to its conversion into a new discipline as clinical neuroscience. In its enthusiasm, psychiatry is perhaps overlooking the historical tendency for mental disorders, once explained by organic causes, to disappear from the field and become subsumed in another medical speciality, usually neurology (Shorter, 1997). If this were to be the case for all disorders, as brain cartography becomes available for more and more of them (Insel, 2010), biological psychiatry would choke on its own success, probably without achieving reincarnation as clinical neuroscience. The point is that this prevailing trend in psychiatry is largely determining the trend in psychopathology itself.

Indeed, psychopathology today is subject to a marked neuro-centric bias, in line with the perspective of biological psychiatry. Psychopathological phenomena are complex human conditions, which require the consideration of multiple aspects – including neurobiological ones – but not their reduction to them. However, the impression given is that psychopathology boils down to neurochemical imbalances and defective circuits (Insel, 2010). This picture is sustained in practice

by neuroimages, consisting in coloured dots in a brain, as though the disorders were there and were actually constituted by those coloured areas. Indeed, neuroimages present themselves, somewhat presumptuously, as showing the *reality* of disorders, as if subjective experience and other psychological aspects did not count, when in reality these aspects are what qualifies the disorder, not the dazzling neuroimages

But it is not simply a case of neuroscience invading psychology, psychiatry and, in turn, psychopathology. The neuroscientific trend appears to be supplanting the social sciences and the humanities, as neuro-disciplines of all kinds proliferate: neuro-economics, neuroethics, neuro-aesthetics, neuro-theology, neuro-politics, neuro-marketing, neuro-education, neuro-culture, etc. In all of these fields the brain appears to have gained primacy in relation to matters that had previously been understood in their context; now it seems a whole range of disciplines are ready to be reconceptualized in terms of the neuronal bases involved, as though in that way they became more scientific, and the facts of them were confirmed once and for all.

Brain-centrism has also established itself in popular culture. The brain seems familiar to us, as if we were on close terms with it, even though it is an organ of which we have no experience; it does not even hurt: what hurts is the head, not the neurons. As far as the brain is concerned, it could be operated on without anaesthetic. Popular magazines and Sunday supplements speak of the brain as another character in our lives, with relevance for our choice of partner, sexual attraction, propensity for going shopping, self-esteem, meditation, mindfulness, solidarity, friendship, and so on. The brain competes with the Dalai Lama and Buddha in the good guy stakes. The discovery of mirror neurons, a kind of neuron that is activated on seeing others doing something, has been a godsend for magazine culture. Popular science articles in thematic periodicals and books for the general reader leave us in no doubt that everything depends on the brain, including the improvement of our lives. Thus, for example, a 2003 special issue of *Scientific American on Research and Science*, entitled “Better brains. How neuroscience will improve you,” speaks of self-improvement, pills for intelligence, brain regeneration and stimulation, mind-reading, stress control, and so on. In a book on mirror neurons (Iacoboni, 2008), already in the subtitle the author alludes to the connection between neurons and empathy, politics, autism, imitation and understanding



others. The spread of neuroscientific knowledge to the general public already constitutes a literary genre that adds weight to the arguments of brain-centrism.

Do the findings and methods of neuroscience oblige us to rethink everything in terms of the brain? Does our knowledge of the brain – which has undoubtedly never been better – really correspond to greater and improved knowledge of aspects such as psychological disorders, the self, freedom, love, ethics, economics, justice or culture? In the end, could it be that brain-centrism amounts to nothing more than fashion, myth and ideology? To what do we owe this neuro-revolution? How did we get to this point?

So, how *did* we reach this point? This is not an easy question to answer. First of all, it is not a question that is in the air, that is being asked, given a pervasive atmosphere in which the brain is the central reference point for everything (the prestige of neuroscience, neuro-disciplines of all kinds, the spread of neuroscientific knowledge to impregnate popular culture). What is necessary is a certain critical approach, to avoid being seduced by this sudden attribution to the brain of everything we do, without losing sight, at the same time, of the importance of knowledge about the brain. Maintaining one's common sense would be a good start. After all, it is we who speak, not our brains (indeed, thinking it is the brain that does things, rather than ourselves, is actually a "psychotic symptom"). Reflecting a little on what neuroimages really say about our lives would be a good way to go on. By virtue of what do some coloured dots on the silhouette of a brain explain matters of everyday life, political attitudes, religious beliefs, economic behaviour, ethical decisions, interpersonal relationships, responses to shop windows, depression, and so on? Can so many aspects – tradition, customs, culture, ways of life that have been learned and transmitted – suddenly be reduced to coloured patterns on a computer-generated picture of a brain? Do we not still deal directly with people, rather than with their brains?

In any case, answering the question of how we have arrived at this point requires considerable reflection, probably of the length a book such as *El mito del cerebro creador. Cuerpo, conducta y cultura* [*The myth of the creator-brain. Body, behaviour and culture*] (Pérez Álvarez, 2011), free from the inevitable constraints imposed by the confines of an article. As regards the consideration of this issue here, it will be developed in four points. First of all, the seductive power of neuroimages is considered. Secondly, attention turns to

the accordance or alliance between brain-centrism and individualism. The third section looks at the decline of the humanities and social sciences. Finally, the dualism-monism loop, as a philosophical framework, comes under scrutiny. For each one of these points a potential remedy is discussed.

### THE SEDUCTIVE POWER OF NEUROIMAGES

It need hardly be pointed out that we are learning more and more about the functioning of the brain; we should not be surprised, then, at its increasingly higher profile in the consideration of human activity. It is not a case here of ignoring the enormous progress represented by neuroscience, nor of spending too much time on listing the advances made. A brief history of knowledge about the brain can be found in González Álvarez (2010). The focus here will be on one of the various methods employed in the study of the brain – probably the most widely used, and certainly the most widely known: functional Magnetic Resonance Imaging (fMRI).

Functional Magnetic Resonance Imaging is a non-invasive method for studying the structure of the body that uses magnetic resonance, through a series of magnets, a radiofrequency generator and a detector, linked up to a computer that processes the data and transforms it into images. Clearly, the sophistication of fMRI constitutes an impressive scientific and technological achievement. The person to whom it is applied lies down on a sliding table which enters the "tube" of a machine, remaining there for the duration of the examination surrounded by powerful magnets. When the purpose of the fMRI session is to study psychological functions, the person performs tasks relevant to the aspect under study, such as watching images projected on a type of glasses with screens, following instructions received through headphones or making decisions on an *ad hoc* keyboard.

What does fMRI measure? It measures blood flow in the brain detected thanks to the magnetism of the oxygenation of the blood. It is understood that the increased flow of blood is required by the neuronal activity in the function being performed at that moment (the experimental task presented). It is interesting to recall that fMRI provides the response to a question posed by William James in 1890. "Blood very likely may rush to each region of the cortex according as it is most active, but of this we know nothing," wrote James. "I need hardly say," he goes on, "that the activity of the nervous matter is the primary phenomenon and the afflux of blood its



secondary consequence" (The Principles of Psychology, p. 82). Thus, blood flow is taken as an indicator of neuronal activity which, in turn, is associated with psychological activity. The resulting coloured image represents, strictly speaking, a measure of blood flow, which is supposedly related to neuronal activity correlative to the behaviour under study (economics, ethics, politics, psychopathology, etc.).

What is more, though, is that the coloured image or neuroimage obtained, far from being a snapshot of the brain, is actually the statistical average of many "takes", often from several individuals, so that it does not really represent the activity of anyone in particular: it is by no means a picture of the mind captured *in fraganti*. Furthermore, the neuroimage is taken in an environment which is totally anti-natural for the activities studied – participants are lying down in the tube of a machine surrounded by magnets, doing nothing but watch an image through some special glasses, listen to instructions or phrases through a headset or push the buttons of a keyboard with their fingers. When we are shown neuroimages related to any human activity, they actually represent the activity of people lying in a machine imagining that behaviour, not in a real situation.

How should we interpret neuroimages? There is a considerable discrepancy between what magnetic resonance measures and the image presented (Vul, Harris, Winkielman, & Pashler, 2009). Even though blood flow is an indicator of neuronal activity, the flow is much slower than the neuronal process, so that there is a lack of correspondence between the two. Moreover, the flow may be feeding more than one neuronal activity, apart from the fact that some neurons might be more efficient than others, and need less oxygen. Nor is it clear how many neurons are necessary to provide a unit of measurement. In addition, fMRI detects active areas, giving the image of the brain as an entity that is more modular than distributed in functional networks – which is almost certainly how it really works –, and this has led some authors to refer to brain mapping as "the new phrenology" (Dobbs, 2005). In truth, neuroimaging studies confirm nothing about the supposed biological origin of mental disorders (González Pardo & Pérez Álvarez, 2008, chap. 8). But regardless of all such problems, there remains the fundamental one of explaining the activity of one field by another, in this case behavioural activity by its correlate, or as we might say, the mind by the brain.

Depending on one's view of it, fMRI represents a great contribution to the study of the brain, insofar as it provides a functional map of areas involved in certain activities, or represents very little, in that what it shows are actually blood flows taken as indicators of neuronal activity associated with behavioural activity. In this regard, it can only be said of fMRI results that they are coarse measures of the activity they supposedly represent, more pretty than precise. In Dobbs's (2005) view, what fMRI offers is something akin to listening to a quartet of violinists but hearing the sound of the instruments condensed into a single noise after the concert has finished, instead of hearing how the musicians play together and complement one another.

Nevertheless, neuroimages undoubtedly have great seductive power, leading us to see more than there actually is – in particular providing neurobiological *explanations* for human activities, as though they were the reason for and the cause of them. Neuroscientific explanations work as *the* fundamental explanation, in relation to the neurobiological foundations of behaviour, the neuronal bases of awareness, etc. Neuroimaging combines the power of science, and for the case of neuroscience, with the power of images to influence people. These images carry the prestige of science and feature the prestidigitation of technology. Despite being nothing more than cerebral correlates of behavioural activities, neuroimages nonetheless serve as the basis for explanatory accounts of the discovery of the neuronal bases and confirmation of this or that activity, as though it had finally obtained scientific guarantees and legitimacy. When we are presented with neuroimages of some activity or other, it is easy to overlook the fact that, in reality, they add nothing to what we knew about the matter, save telling us where the neuronal correlate can be found.

Experimental studies reveal the seductive attraction of neuroscientific explanations, their magnetism, so to speak. It has been shown how irrelevant explanations are judged more favourably if they contain neuroscientific jargon. Regardless of their scientific status and relevance, neuroscientific explanations do influence people, and beyond what the evidence can actually support (Beck, 2010; Weisber, Keil, Goodstein, Rawson, & Gray, 2008).

### **Critical neuroscience**

One of the responses to the brain-centrism which dominates at present, represented here by the seductive



power of neuroimages, has been the emergence of critical neuroscience. Critical neuroscience is an approach that attempts to understand, explain, contextualize and, where necessary, criticize developments in relation to social, affective and cognitive neuroscience, with a view to creating the competences necessary for addressing in a responsible manner the new challenges and issues that emerge in relation to brain science (Slaby, 2010). It looks at questions such as: What is happening in contemporary neuroscience that affects society in such a substantial way? Do these effects correspond to findings that oblige us to understand human affairs differently, or are we overestimating their impact while failing to take into account other important forces of social and cultural change, such as the development of capitalist economies? How, and through which channels, does neuroscience interact with current conceptions of the self, identity and well-being? What are the predominant “thinking styles” to have emerged from the neurosciences and “neuro”-disciplines? How is neuroscience institutionally and politically linked to agents such as pharmaceutical companies, funding bodies, policymakers, and so on? Issues of this nature are examined by critical neuroscience, which tends toward a more responsible use of neuroscience (Slaby, 2010).

The term “critical” refers here to an examination of scientific practices and institutions, as well as the social contexts in which these develop, instead of simply accepting neuroscientific “findings”, often in the form of neuroimages, as an uncritical explanation of everything. More specifically, it involves bridging the gaps between the sociological, philosophical and anthropological analysis of neuroscience, so as to explore the way in which behavioural and social phenomena are studied in laboratories, above all when the results are reified in biological terms, and to analyze the social and cultural conditions that sustain such reification. With this purpose, critical neuroscience turns to a variety of disciplines including, as highlighted by Choudhury, Nagel and Slaby (2009): 1) Historical analysis of how particular problems become questions for neuroscience, such as the criminal brain, post-traumatic stress disorder, at-risk adolescents or empathic women, and how certain methodologies are given more value than other more pertinent ones. 2) Technical and conceptual analysis of research processes, including assessment methodologies. 3) Ethnographic analysis of research sites, technical practices, concepts and professional activities, as well as of the researchers

themselves and their training, world view, methodologies and thinking styles. 4) Study of the “public commitment” of science in terms of the interplay of neuroscience, the media, industry and politics. 5) Identification and monitoring of the “trails” of economic influences. 6) Social and cultural analysis of socio-political contexts relevant to modern science, as well as the broader context in which it is practiced. 7) Integration of these aspects of critical neuroscience (points 1 to 6) in the laboratory. The aspects mentioned are understood as giving reasons for concern and caution in relation to methodological questions, such as the way individuals are categorized, how human characteristics are conceived, or what is considered pathological and why.

A critical approach must be “balanced” with a reconstructive perspective. Even if criticism makes a positive contribution, its credibility will be greater insofar as it offers an alternative. Following the exposure of the fashion, myth and ideology of the creator-brain, the alternative proposal would be a reconsideration of human activities according to the trinomial body, behaviour and culture, in which the brain itself becomes a “dependent variable” as much as or more than an “independent variable” (Pérez Álvarez, 2011). As argued in the cited work, brain plasticity reveals the structural and functional organization of the brain in accordance with people’s behaviour, abilities and ways of life. Thus, as an illustration, it is not the greater size of the hippocampus that leads one to become a London taxi driver; rather, it is the skill required and the practical experience as a taxi driver that changes the cerebral structure and function observed in London cab drivers. Brain plasticity permits us to understand the effects of life conditions on the brain. If one lives for long periods in oppressive, stressful, hopeless and anxiety-inducing conditions, as Gergen (2010) argues, it is entirely possible that one’s cortical connections will be altered. In terms of cause and remedy, continues Gergen, it is better to focus on the cultural origins than on brain mechanisms. If cultural conditions have produced cortical alterations, then changing a person’s life conditions would appear more beneficial than pharmacological sedation (Gergen, 2010, p. 803).

#### **BRAIN-CENTRISM AND INDIVIDUALISM: HAND IN HAND**

Brain-centrism, referring to the tendency to explain human activity in terms of the brain, today represents the final frontier of individualism and the clearest reference





framework for interiority. The individual is no longer defined so much by the self as by the brain, so that authors refer to neuronal man or the synaptic self, if not, indeed, to the self as an illusion created by the brain. Memory and recall are located in the hippocampus and consciousness in the thalamo-cortical system, or even in intra-cellular microtubules. Empathy and understanding depend on mirror neurons. It would seem that it is no longer us who sympathize with and feel for others, but rather our mirror neurons. The brain supplants the person. The concept of our being a brain rather than a person has become a feature of our times (Vidal, 2009). What was supposedly done by people before is now attributed to the brain: the brain thinks, decides, knows, remembers, lies, creates illusions, and so on. It is the creator-brain.

Everything appears to indicate that the brain lends itself to embodying the tendency toward individualism in society. Thus, the brain is not only the site of the self and the platform for the identity, but is also a source of reserves for personal growth and the development of one's own potential (there is a Dalai Lama in your brain). Change your brain and you will change your life and the world, they say. Things that are done to improve one's life, from meditation to the cultivation of friendship, are already seen as more justifiable for how they change the brain than in their own right. The world, others and your activities become a medium for training *your* brain. Your brain is all you need: inscribed in it are your history, what you are, memories, traumas, knowledge and skills, and it also contains your life's horizons, your self-satisfaction, your self-esteem, happiness, inner peace, healthy ageing, and so on. Your problems and their solutions are in the brain. Didn't you see the coloured dots in there, indicating your depression, anxiety, obsessions, etc.? And don't they change when you get better? All in all, the brain has become the embodiment of individuality and the culmination of interiority. The journey to the interior terminates in the brain.

Indeed, brain-centrism represents the culmination of the interiorizing trend of individualism, insofar as the brain is the last frontier and redoubt of our inner world. There is nothing deeper and more personal within us than *our* brain. Psychological aspects such as empathy, jealousy, envy, anxiety or depression being things of the brain, the brain becomes the object of examination and the focus of personal change. Self-understanding would no longer involve examination of one's personality and way of being, in accordance with the vicissitudes and

circumstances of life, but would rather consist in the identification of cerebral areas and circuits, supposedly responsible for our behaviour and inclinations. For example, the severity of a depression could be found deep in the brain (nucleus accumbens, etc.), so that it has become the target of stimulation for increasingly promising treatments. Changes for improving the human condition would involve changing, not society or the individual, but the brain. The point is that brain-centric explanations can easily lead us up the wrong path, when the objective becomes to "improve" the brain, instead of improving the world and changing people's conditions and ways of life. Quite apart from diverting attention away from real conditions, brain-centrism can bring with it a new pathogenic reflexivity, converting the brain, its images and its imaginings into the object of excessive reflection.

On the other hand, the brain is also a supporting element for the mentalist tendency of cognitive psychology. Indeed, the mentalist tendency of cognitivism has landed on the brain bearing the standard of "cognitive neuroscience," as predicted a quarter of a century ago during the cognitive revolution ongoing at that time, in an article in this same journal entitled *Fashion, myth and ideology of cognitive psychology* (Pérez Álvarez, 1985). Cognitive psychology's free fall into mentalism, it was argued, is destined to end up at the brain, "insofar as the nervous system underpins (validates, gives consistency to or backs up) processes that cannot sustain themselves alone." The reference was to internal cognitive processes that are deduced, somewhat tautologically, from the very behaviour they set out to explain. "There is nothing wrong with investigating cognitive processes in the brain," wrote the author, "except that it would cease to be psychology," to end up as cognitive neuroscience or something of that nature. The alternative, then as now, is to study people's behaviour as a whole in relation to their environment (body, behaviour and culture). The challenge for our times in psychology is to confront this brain-centric trend (Gergen, 2010; Miller, 2010; Pérez Álvarez, 2011).

### *Exposing the ideology*

In contrast to the uncritical acceptance of neuroscientific findings related to human activity, as though they were the last word on the subject, it is proposed to expose the correspondence – we might even say alliance – between the uses of neuroscience and individualism, with all the



associated implications for interiority. The danger is that these brain-centric trends could lead to a kind of “unitary thought” which works to the detriment of the functions and values traditionally attributed to the individual and the person, starting with the capacity for directing our own lives and responsibility for our actions, both now under the threat of assignation to the brain, an impersonal entity.

We might indeed ask ourselves, like Francis Fukuyama (2002), if we are not already post-human, and thus in the hands of biotechnology: genome, genetic engineering, psychopharmacology, neuroscience, and the rest. The truth is that biotechnology, for all its progress, has not yet projected human beings beyond the human condition. Rather, it has underscored how human, how all-too-human we are in this technological age. Biotechnology can offer us extended youth, supposed happiness, power over the contingencies of life and escape from the “fear of freedom.” If freedom is a sought-after ideal and often has to be fought for, then equally real is the fear of freedom, given the responsibility it entails, as shown by Erich Fromm in his celebrated study. The perfect scapegoat in this sense is the brain, with the complicity of the genes.

Biotechnology, and in particular neuroscience, with its reductionist explanations in which neuronal correlates are freely converted into accounts of how the brain makes us what we are, etc., has absolved us of a large part of the responsibility for our lives, especially in areas where we would expect greater capacity for decision-making and self-control. Likewise, brain-centric explanations can easily lead, as mentioned above, down the wrong path, when the focus turns to “improving” the brain, instead of improving the world and changing people’s conditions and ways of life. According to the ideology of the brain, the explanations and solutions for our problems, from “mental health” to the pursuit of happiness, are the business of the brain (psychopharmacology, neuronal training, etc.). The emphasis is on “perfecting” the brain itself, rather than the person, overlooking the fact that it is the person *who* has to do it in any case. The point is that taking the brain as the object may be a mistaken course, since it leaves intact the conditions on which our problems depend (ways of life, disorientation, consumerism, etc.). It is almost as though, by concentrating on the brain, there is a desire to let society off the hook, despite all its contradictions and other causes of distress.

The ideology of the brain achieves its maximum expression in the supposed correspondence between

cerebral organization and economic liberalism (decentralization, outsourcing, connections through networks, etc.), as though, at last, we had arrived at a society (today’s) that were in harmony with the natural form of functioning of the human brain. Thus, we can observe an affinity between the literature of state-of-the-art neuroscience and the fashionable discourse of neoliberal politics and organizational management (Slaby, 2010). Both neuroscience and neoliberal politics emphasize outsourcing, decentralization, connections through networks, flexibility and the capacity for adapting to continually-changing circumstances and demands. It is as though the brain had evolved in order to fit in with flexible capitalism – as if through capitalism we had finally arrived at an alignment between the brain and the organization of the world. In this context it is no surprise that people talk about the “Wall Street neuron” (Zimmer, 2011), referring to the similarity between stockbrokers’ networks of influence and neuronal networks. Liberalism is seen as natural in analogy with the brain as described by current neuroscience. The classic Weberian association between the Protestant work ethic and the spirit of capitalism is echoed in today’s relation between neuronal man and the spirit of the new capitalism (Malabou, 2007). This association implies that economic liberalism is hardwired in the brain, as though the goal of cerebral evolution were to find a society in keeping with its functioning. The fashionable metaphor in explanations of the brain is no longer the computer, but rather the discourse of economic liberalism.

The point is that a way of describing the functioning of the brain using the metaphor of economic liberalism is taken as its natural form, which in turn “naturalizes” the source of the metaphor – economic liberalism itself –, as though this were the natural order toward which humanity were progressing. Given that what makes the brain such a brilliant and powerful organ is not exactly its ability to give rise to economic systems or fit into any one in particular, but rather to make possible and facilitate ways of life corresponding to human adaptation and the various forms of human existence, among them capitalism, thanks to brain plasticity, it is not unreasonable to suspect that the brain is being used in this context for ideological purposes, to justify and lend natural legitimacy to a particular system. The individual thus becomes subsumed in the system, as though it were our natural habitat, given the supposition of correspondence between neuronal functioning and the



spirit of capitalism. The possible, and even probable maladjustments of the individual in relation to the system, consisting, for example, in depression, anxiety, compulsions, addiction or schizophrenia, become maladjustments of the electro-chemical workings of the brain (neurochemical imbalances, defective circuits, etc.). Both society and the individual are cleared of responsibility. The “collateral effects” of maladjustment between the individual and the system are also questions of neuronal tweaking, with the emphasis on stimulants and tranquillizers. Moreover, far from irrelevant in all of this is the trend toward the pathologization of everyday life (González Pardo & Pérez Álvarez, 2008).

### THE DECLINE OF THE HUMANITIES AND SOCIAL SCIENCES

The ascendancy of neuroscience, with all its prestige and seductive power, is paralleled by the decline of the humanities and the social sciences, to judge not only by their loss of attractiveness as professional careers, but also by the proliferation of neuro-disciplines. It would seem that the human and social disciplines needed to be validated and confirmed by neuroscience – by neuroimages that reveal the areas involved in human activity, as though it were all of the brain’s doing. Given that there must of necessity be some neuronal correlate of any human activity (economic, political, religious, ethical, aesthetic, educational, psychopathological, etc.), its conversion into an explanatory neuroscientific account of the phenomenon in question is all too easy. Thus, the correlate corresponding to, say, economic, political, religious or ethical activity lends itself readily to explaining that phenomenon in terms of the brain, totally ignoring the person *who* is in reality the one doing the activity. And not only is the person ignored, reduced to the brain – committing in this case the mereological fallacy (attributing to parts of an animal attributes that are properties of the whole being) –, but also the very conditions that make the person (including their brain) possible, culture and society, without which there would be no brain to examine in the first place. What is overlooked is that the cultural context and social environment are historically given realities, supra-individual and pre-existing any brain studied in a neuroimaging scanner. This being the case, it is pointless to reduce things to the brain and deduce from it what the person learned and became thanks precisely to the social-cultural context.

What seems to be the case is that the brain supplants the person and neuroscience emerges as the queen of the sciences relating to human activity, and thus as guarantor of the humanities and social sciences. The humanities and social sciences lose their prestige and autonomy in favour of neuroscience. Although neuroscience is billed as an interdisciplinary science, the truth is that it ends up taking precedence over the others, insofar as it is understood to provide the “neuronal bases” of this, that and the other. Such precedence, reflected in the typical expressions in use (“neuronal bases”, “neuro-x”, x being the discipline in question), is assumed even though the “neuronal bases” of the activities under examination do not contribute any better or more profound knowledge compared to the “traditional” disciplines that study them (apart from, once again, telling us about the correlates involved, of which there of course have to be some). The fact that complex and distributed neuronal networks are activated when a person makes ethical or any other types of decisions changes nothing with respect to the ethical or other issue in question. Now, if the attribution of the decision to the brain (as though the brain were making the decision) means overlooking the person and absolving them of responsibility, then something indeed changes, but more of an ethical and philosophical order than a neuroscientific one. This raises an ethical and philosophical problem about the basis on which an organ or one of its parts can be considered as the subject-agent of human action. Taken to the extreme, these ethical and philosophical questions would also be matters for the brain, which would lead to a kind of cerebral solipsism. It is almost enough to provoke mass hysteria.

Nevertheless, the decline of the humanities and social sciences is not a direct effect of neuroscience, but rather derives from a wider context of historical-social changes, which should indeed be studied within a historical and sociological perspective, and certainly not in neuronal terms. This context involves the preponderance of the natural sciences and the organization of the world in accordance with technological developments. Such preponderance of the sciences over the humanities has been identified in terms of the “two cultures”, after Peter Snow’s 1959 treatise, in which he argued that progress goes hand in hand with scientific culture rather than with humanistic culture. The background to these changes can be found in the “great transformation,” as described in Karl Polanyi’s 1944 work of the same name (Polanyi, 1989), whereby the market and productivity ended up





organizing human life, leaving behind community-based ways of life, and alluding to the change from community to the society of individuals that occurred at the end of the nineteenth century (Nisbett, 2009).

In any case, the greatest cultural transformation coinciding with the rise of neuroscience comes in the late 20th century, from the 1980s onwards – just twenty-odd years ago, practically with the last generation, the generation of Internet, Facebook, Prozac, Big Brother and the rest. This era has been characterized by sociologists with terms such as “liquid times” (Bauman, 2007) or “world-culture” (“*cultura-mundo*”) (Lipovetsky & Serroy, 2010). It is a time in which “something is wrong” in Western countries, as the late historian Tony Judt (2010) puts it. The philosopher Martha Nussbaum refers to a “silent crisis” worldwide in matters of education (Nussbaum, 2010). The image of “liquid times” suggests the liquation of social structures and frames of reference, leading us in to uncertainty, disorientation and an incapacity for loyalty and commitment. As Marx might well say again today, “all that is solid melts into air” in the consumer society. For its part, the “world-culture” concept, referring basically to the universalization of commercial culture, signifies the triumph of the market, techno-science, the media, consumerism, the individual, and with all of that, the emergence of a series of existential problems (identity, beliefs, crises of meaning, personality disorders, etc.). As Judt writes: “Something is profoundly wrong with the way we live today. For thirty years we have made a virtue out of the pursuit of material self-interest: indeed, this very pursuit now constitutes whatever remains of our sense of collective purpose. We know what things cost but have no idea what they are worth. [...] The materialistic and selfish quality of contemporary life is not inherent in the human condition. Much of what appears ‘natural’ today dates from the 1980s” (Judt, 2010, p. 17). As far as Nussbaum’s “silent crisis” is concerned, it consists in the elimination of subjects and courses related to the arts and humanities in favour of education geared to profit and economic growth. The result, argues Nussbaum, is the loss of a capacity for reflection and critical thinking, and she therefore sees the humanities as profoundly necessary.

The supplanting of the citizen by the consumer, a figure with which people readily identify today, constitutes the culmination of this transformation. The individualistic and interiorizing trend referred to earlier, and to which neuroscience contributes, is a manifestation of this

transformation. Neuroscience itself emerges in a context of the preponderance of science in the organization of life, and contributes, in turn, in a decisive way to impeding the analysis and acknowledgement of the situation, on reducing human activities to cerebral processes, as highlighted so seductively by the technology of neuroimaging.

### *In defence of the three cultures*

In this context predominated by science and technology and where the focus is on the market and productivity, the humanities and social sciences are all the more necessary, but paradoxically in decline, as borne out by the above-mentioned silent crisis of education and by their diminishing prestige as subjects for study and professional careers, as well as their apparent complex about the need to pass their content and knowledge “through the neuroimaging machine.” The importance of the humanities and social sciences is perceived in the uncritical reception of neuroscientific explanations of human activities by recourse to the brain, by our surrender to seduction by neuroimages, and finally, by the image of the human being as social brain, ethical brain, neuronal man, synaptic self, neurochemical self, and all in all, creator-brain (Pérez Álvarez, 2011). Such images are suggestive of man as already belonging to a post-human era. However, nothing of what is attributed to the brain and expected of it is less (or more) than human, including its use in waiving us of responsibility and providing impersonal explanations of matters in which we are personally involved.

Given this situation, it is time to mount a defence of the humanistic tradition and the social sciences, in parallel with neuroscience. In reality, neuroscience should be seen as just one more product of the humanistic and human sciences tradition. Faced with the hegemony of neuroscience, often masquerading as an interdisciplinary science, the proposal is to rehabilitate the concept of the “three cultures” – the natural sciences, the social sciences and the humanities –, following Jerome Kagan’s (2009) characterization. Each one of the three cultures involves a particular type of knowledge, with its foundations, objectives, sources, etc., which cannot be reduced to others or ignored. Concerning oneself with just one “culture” means losing sight of knowledge and content that is essential to a sound understanding of human affairs. As Kagan (2009) concludes, like tigers, sharks and falcons, each member of one of these cultures is



powerful in their own environment, but powerless in that of the others (p. 275).

Here, the reprimand is aimed primarily at neuroscientists obsessed with their own knowledge and at social and human scientists seduced, if not indeed besotted, by neuroscience, to judge from their keenness to have their knowledge validated by neuroimages and to convert the neuronal correlates into neuroscientific accounts of human affairs which up to that point they had studied without feeling the need to refer to blood flows in the brain (which is what the neuronal correlates actually amount to). It would be ironic if in this reaffirmation of the “three cultures” it were the neuroscientists who expected the others to adopt their “culture,” given that the issues in question (the self, awareness, activities and behaviour of all types) constitute the environment, terrain and subject matter of the others. Indeed, the methodological, epistemological, ethical and philosophical problems explored by the neurosciences are not actually neuroscientific in nature, or solvable through neuroimaging; rather, they relate to the “culture” of the social sciences and humanities. If the humanities constitute a whole tradition and represent classical studies, it is perhaps due to the fact that they address issues and problems which are, so to speak, “perennial,” and in any case predate neuroscience. On what basis has the neuroscience of recent years, with its new brain mapping technology, established itself as the foundation of everything? Suffice to think, for example, that the reading of neuroimages was not foreseen in cerebral “design,” given that reading is a subsequent invention which depends on the development of science, and for the case at hand, the very cartography of the brain. It is social institutions that sustain the sciences, and without them there would not even be such a thing as neuroscience. To cite *The myth of the creator-brain*: “if for some reason writing were to disappear from the face of the earth, who knows whether human beings might take another six thousand years to reinvent it, when a child today learns it in a couple of years. As long as it remains on the scene, writing functions as a kind of ‘evolutionary ratchet’ preventing us from going backwards, but not because it is inscribed in the brain, rather because it is institutionalized, forming part of the environment in which people’s lives unfold” (Pérez Álvarez, 2011).

As a possible way out of this situation, Lipovetsky and Serroy advocate a new general culture based on the culture of meaning and of history, enabling us to recover

the distance and profundity of duration as against the excess of present and of information (Lipovetsky & Serroy, 2010, p. 180). Likewise, Judt proposes a kind of “historical memory” that would allow us to perceive the contrast between “the world we have lost” since the previous generation and the economic distress we are experiencing now. At the political level, Judt calls for the return of the State as an intermediate institution “standing between powerless, insecure citizens and unresponsive, unaccountable corporations or international agencies” (Judt, 2010, p. 185). For her part, Nussbaum (2010) mounts a defence of the humanities, highlighting their relevance and importance in the modern world. Thus, for example, familiarity with “Socratic dialogue” would permit the development of reasoning and critical thinking, helping us to ask about the meaning of things and where they come from. Socratic teaching would likely contribute to the capacity for argumentation, as protection against becoming enraptured by seductive but misleading accounts (for the case at hand, neuroimages).

A stronger background in humanities and social sciences is not detrimental to the natural sciences, or to neuroscience in particular (even though the contrary may be true, or seemingly so up to now). Rather, not only would neuroscience, with its interest in human affairs, be valued for the merits of its findings, but these better credentials would also redound to the benefit of the other two “cultures.” Neuroscientists, rather than being content to adorn their work with quotations from philosophers, humanists and artists, should broaden their knowledge so as to give themselves more authority in the field. In any case, neuroscientists lag behind in studying within and from the brain what people already actually do and has relevance in its own right in the real world. For instance, artists know more about human affairs than what neuroscientists can deduce from the brain. Proust and other artists of the modern age are ahead of what neuroscience might be able to say about the functioning of the brain. And just what neuroscientists can say is yet to be seen, whilst the artists’ findings are already here (see *Proust Was A Neuroscientist*, by Jonah Lehrer, 2010). General interest books such as that by Javier Tirapu (2008) make an important contribution. Tirapu’s work combines the three cultures: neuroscience, psychological science and humanities (literature, culture and humour). Given the “neuroscientific complex” from which many human and social scientists appear to suffer, it could be said, without exaggerating too much, that



neuroscientists who ignore the other two “cultures” or simply do not partake of them are more ignorant than human and social scientists who know nothing of brain areas and neuronal circuits. After all, the sharks of neuroscience are hunting species that belong to the world of the tigers and falcons.

### THE DUALISM-MONISM LOOP

The underlying philosophical question for neuroscience is the flight from Cartesian dualism only to fall into materialistic monism. Whilst dualism makes a distinction and separation between the immaterial mind (*res cogitans*) and the material body (*res extensa*), monism dispenses with one of the parts (the mind), reducing it to the other (in this case, the brain). As Kandel, Schwartz and Jessell (2001) put it, “Philosophically disposed against dualism, we are obliged to find a solution to the problem in terms of nerve cells and neural circuits” (p. 1318). Thus, it is taken for granted that all the phenomena previously ascribed to the mind are properties of material. This materialistic monistic position, these authors point out, represents a break with dualism. However, as it will be shown here, monism turns out to be a solution replete with dualism.

The error of dualism lies in the separation between two irreconcilable realities, given that one is material or corporeal and the other immaterial or incorporeal, so that their mutual influence is incomprehensible. It would be “Descartes’ error,” according to the celebrated work of the same name by Antonio Damasio, originally published in 1994 (Damasio, 2001). On the other hand, monism is not without its error, either. The mistake of monism is to ascribe the attributes of one category to another: of properties of the mind (or psychological properties) to properties of the brain (or physical-chemical properties). Its solution to the problem of dualism consists, as mentioned earlier, in reducing one of its parts to the other, the mind to the brain. This would involve a “category error” or “mereological fallacy,” consisting in this case in attributing to a part (the brain) the properties of a whole – the organism or individual acting in an environment (Bennett, Dennett, Hacker, & Searle, 2008). But we might also consider the question of “Damasio’s error,” insofar as the ascription of the mind’s properties to the brain is actually his solution to “Descartes’ error.” In his 2003 work *Looking for Spinoza* (Damasio, 2005), Damasio attempts to solve the problem of Descartes by recourse to Spinoza, adopting the latter’s dual-aspect monism,

according to which thinking and extension would be attributes of the same substance, be it God or Nature. Spinoza serves Damasio sometimes for attributing the mind (the self, consciousness, etc.) to the brain and at other times for making it emerge from the brain, revealing the ambiguity of this author’s position, which fluctuates between reductionism, dual-aspect monism and emergentism.

Even when Damasio incorporates the body, particularly in his book *The Feeling of What Happens* (Damasio, 2001) – which might suggest a holistic approach, more organismic than organic – the role of the body is reduced to its representation in the brain. Once again, the brain becomes the place where everything occurs, a sort of “Cartesian theatre,” to use the expression famously coined by Daniel Dennett in *Consciousness Explained* (Dennett, 1995), in which he pointed out the dualism that persists among neuroscientists, despite the fact that they renounce it and swear to have left it behind. In a later book in which he updates his previous work (*And the Brain Created Man*, 2010), Damasio still fails to escape the dualism-monism loop, asking presumptuous questions about how the brain makes or builds a mind, and so on.

The point is that dualism is not overcome through materialistic monism: neither reductive monism which eliminates the mental dimension, nor Spinoza’s dual-aspect monism – if indeed such a thing as dualistic monism actually makes sense (Pérez Álvarez, 2011). If the materialistic monism advocated by neuroscience is a reaction to Cartesian dualism, it only gives way to a new version of dualism that emerges as a reaction to the monism.

Those dissatisfied with materialistic monism endorse and reformulate dualism, which is still most certainly alive and well. Dualism persists not only thanks to the neuroscientists who, seeking refuge in monism as we have seen, inadvertently uphold it, but is also advocated quite proudly. The peculiarity of this new dualism is that it provides experimental evidence of the power of the mind over the brain and formulates this determination on the basis of quantum physics (Schwartz, Stapp, & Beauregard, 2005). The experimental evidence comes from studies showing the effect of will, effort and conscious self-regulation in changing emotional responses to their “natural” stimuli – for instance, responses to aversive or erotic stimuli, or in the case of obsessive-compulsive patients, to situations that would instigate obsessive behaviour. After exercising the



required self-control, the customary aversive, erotic or obsessive-compulsive responses to the stimuli that provoked them undergo change, and these experiential and behavioural changes involve cerebral alterations observable in neuroimages. This determination of the mind over the brain is understood by the cited authors according to quantum physics. Assuming the brain to be an indeterminate quantic system, involving infinite possible connections at any point in time, it would be capable of being influenced by the “observer”, in accordance with the concept of quantum physics whereby observation alters and “fixes” certain connections. Here, the observer is the individual him/herself exercising wilful control in the face of the established tendencies.

While acknowledging the evidence on the power of the will and self-control over one’s own emotional responses and behavioural regulation, including the corresponding cerebral changes, this evidence does not justify dualism. Although this evidence refutes monism, and convinces the dualists themselves that they are right, the dualism is not sustained in terms of the power of a supposed *immaterial* mind over the brain, as in *spirit over material* [if this were the case it would lend credence to *The Secret*, a sort of “sympathetic magic,” more or less akin to positive psychology, and which inhabits the technological society of information]. This dualism, victorious over monism, entails two problems. These two problems are identified in the following section, *Philosophical materialism*, which introduces the philosophical alternative to the dualism-monism loop.

### ***Philosophical materialism***

First of all, the mind of the quantum dualist is as material as the very brain it determines, even though we are not talking here about physical-corporeal material, but not because quantum physics refers to incorporeal magnetic fields, without mass, rather in view of the very nature of will power and other psychological “forces”. Willpower, effort and self-regulation, to continue with the terms already introduced, are of course forces with some kind of materiality. These forces would have to be identified as a type of mental, psychic, psychological or behavioural materiality. A type of materiality that neither floats nor is separated from the body, nor can be reduced to the kind of physical-corporeal materiality of the body itself. The fact that the person’s behaviours influence the brain (through quantum physics or otherwise) indicate their material nature. The thing is that the material is plural and

heterogeneous, not of a purely physical-corporeal nature, as maintained by monism. In reality, the materialistic monism of neuroscience is physicalism. It is a vulgar materialism, lacking a conception of material corresponding to its plurality, with all its discontinuities and co-determinations, and which avoids reducing all its types to just one (monism). Dualism is, at least, plural, and thus corresponds better to plural reality. In this sense, dualism overcomes monism. The problem of the new dualism is that, fleeing in this case from *physicalistic* monism, it also fails to recognize the materiality that constitutes behaviour, despite the patency and potency of the will and other forces of human action and self-control. Dualism also displays a physicalist prejudice, on assuming that material is solely of the physical-corporeal kind.

Materiality of the psychological kind is verified in its very plurality of content, consisting, for example, in experiences, memories, feelings, emotions, desires, thoughts, habits, greed, ambition, etc., often in conflict with one another. Thus, the pain of appendicitis is as material as the intestine itself. The topic or content of a conversation is as material as the sound waves and laryngeal and neuronal activities involved, though of a different nature from the physical-corporeal kind. “The stuff that dreams are made of” (*sic*), is defined neither by cerebral activity nor by the “materials” of the dreamed-about, desired or coveted objects. Casting one’s mind back to the end of the famous film *The Maltese Falcon*, it is hard not to agree that the avarice and ambition which drove the quest for the figure of the falcon are as material as the lead from which it turns out to be made. To the question of what “the bird” must be made of to have led people to die trying to obtain it, the main character (Humphrey Bogart in the role of Sam Spade) responds, paraphrasing Shakespeare: “The stuff that dreams are made of” (in this case, avarice, ambition, etc.). The conflicts between some memories and others, between incompatible desires or between a decision and a habit, as in the experimental evidence from quantum dualism, constitute a type of reality, not to say materiality, whose status as such is not conferred by the physical-corporeal reality of the organism. These psychological realities are defined more by their temporal dimension and operant function than by the spatial dimension of the neuronal correlate involved or the mere physical-metric topography on whose basis one can measure the expression, reaction or behavioural action. The psycho-somatic repercussions,



as well as the effects on the world, including others, testify to the materiality of a psychological nature. If it were not material, how could the supposed immaterial mind influence the organic materiality of one's own body? – not to mention the effects on the outside world. The problem of dualism, as mentioned earlier, is that it is subject to the same physicalist prejudice as monism, lacking the conception of a materiality of the "mind," which would in any case be *embodied* as an activity of an organism and *embedded* in the world, to use the terms suggested by Haugeland (1998).

A second problem of dualism is that it leaves unanswered the question of where willpower, effort and conscious self-regulation (or "mind") come from; they are simply there, just like that (monists would turn to the concept of emergence from the brain). As far as the present discussion is concerned, the response is as obvious as it is fundamental, and therefore cannot be ignored. The human mind, consisting in a great diversity of actions and reactions, is made up of content and forms which derive from the society and culture of reference. A person's mind has its condition of possibility in society and culture, supra-individual realities that pre-exist the individual mind in question. It goes without saying that society and culture constitute a material reality that neither can be reduced to physical-chemical reality (despite being made up of bodies, objects and things), nor is the product of the human mind, since the social and cultural reality precedes anyone's mind and, to reiterate, is its condition of possibility. The willpower and self-control from which dualism infers the power of the mind presuppose a society that brings into play those values and strategies and the education and training they imply – a series of "mental institutions" (Gallagher & Crisafi, 2009). The point is that these *social institutions* are just as real and material as the *activities* of the experimental participants and their *brains*, even though each reality has its own kind of materiality.

As Hamlet might have said to Horatio, there are more things in heaven and earth than are dreamt of in materialist monism. In the idea of material, as has been argued, and according to philosophical materialism, three types of materiality are distinguished: physical material, psychological material and the material of abstract objectivities. They are not isolated from each another, but nor do they emanate from one another, and together make up the world. These three types, with antecedents in the scholastic tradition – World, Soul, God

–, are designated by Karl Popper as World 1 (the world of physical things), World 2 (the world of the mind) and World 3 (the world of objective knowledge and cultural productions) (Popper & Eccles, 1977; Popper, 1994), and by Roger Penrose as Physical World, Mental World and Platonic World (Penrose, 1996; 2006). For his part, Gustavo Bueno, in his proposal of philosophical materialism, calls them, respectively,  $M_1$ ,  $M_2$  and  $M_3$ , so as to avoid any metaphysical substantialism potentially implied by the term "world" (Bueno, 1972; 1990).

$M_1$ , or physical material, refers to entities that compose the physical world, from subatomic particles, molecules, intestines, bodies and things such as the figurine of the Maltese falcon, to planets, other heavenly bodies, and indeed, "the starry sky above me," as Kant put it. On the scale of the phenomenic world, the reference for  $M_1$  is the human body in relation to other bodies and everyday objects. In the context of neuroscience,  $M_1$  refers primarily to neurons, associated molecules and neuronal circuits.

$M_2$ , or psychological material, refers to experiences such as "the pain of appendicitis", mental events and behavioural activities, including those that would be involved in the pursuit of the Maltese falcon. In any case, the concept of mind, in accordance with Gilbert Ryle's classic treatise from 1949 (Ryle, 2005), is best described in terms of behavioural dispositions and behaviors performed in the public realm, and this for reasons both logical and pragmatic. The materiality of the psychological category has already been pointed out. In a sense, the problem of mind would be solved if we were talk of the *person* instead. "Where logical candour is required from us," says Ryle, "we ought to follow the example set by novelists, biographers and diarists, who speak only of persons doing and undergoing things" (Ryle, 2005, p. 192). The next step would be to turn directly to Skinner.

$M_3$ , or the material of abstract objectivities, refers to supra-individual realities, pre-existing any individual, from concepts and ideas such as those of mathematics to cultural productions and social institutions, including "the moral law within me," of which Kant was as much as or more in awe than the starry sky. The authors of reference (Bueno, Popper, Penrose) take mathematics as a model of abstract objectivity, but cultural productions and social institutions likewise form part of the realities included in  $M_3$ . Even though  $M_3$  consists of human products, they have objectivity and autonomy with respect to the





concrete individuals who contributed to their “discovery” and construction. Thus, for example, the theorems of Thales, Pythagoras and Euclid no longer depend on these men as psychological subjects, if indeed they were even products of their “minds”, and did not actually emerge from practices culturally widespread during their times. In fact, they are presented as objective knowledge to all students and practitioners of arithmetic and geometry. Such theorems are neither psychological nor cultural, but rather impersonal, atemporal and universal (objective), like scientific knowledge. Also, language, social norms, ways of life, so-called “mental institutions”, etc., at the same time as being human products, constitute conditions of possibility for the human being, including the development and functioning of the brain itself.

Philosophical materialism is opposed to any kind of monism, which would give priority to one type of material over the other two, be it physicalist reductionism, psychological reductionism (panpsychism, spiritualism or idealism) or essentialism according to some version of Platonism (such as that of Penrose); it is also opposed to dualism of any sort. For example, it is not possible to understand psychological realities ( $M_2$ ) without considering the objective, historical-cultural world ( $M_3$ ).  $M_2$  not only interacts with  $M_1$ , as dualism maintains, but also with  $M_3$ . In turn,  $M_3$  (ideas, scientific knowledge, projects, institutions, educational system, writing, etc.) can only act on  $M_1$  (roads, airports, particle acceleration, surgical interventions, magnetic resonance, cooking, etc.) via  $M_2$  (operative subjects, and not, by the way, through their “minds”, but rather through their actions and reactions, in short, their behaviours).

Hence, there would be not one, not two, but three kinds of materiality making up the anthropic world, in accordance with mutual co-determination. An example of co-determination between the three categories, of particular relevance here, can be found in the theory of bio-cultural co-constructivism proposed by Paul Baltes and cols. (Baltes, Rösler, & Reuter-Lorenz, 2005). The idea is that the brain, behaviour and culture constitute a continuous, interdependent and co-productive transaction and reciprocal determination, and this both on an evolutionary scale (co-evolution) and ontogenetically throughout the life span (co-constructivism). Types  $M_1$ ,  $M_2$  and  $M_3$  are now realized in brain, behaviour and culture. Even though it would be more appropriate to speak of the body, the reference to the brain can be justified on the basis of its controversial quality for

confronting the brain-centrism described in the present work. As shown by the different contributions to the book by Baltes and cols. (Baltes, Reuter-Lorenz, & Rösler, 2005), referring to different domains (language, writing, emotion, music), ages (from the neurodevelopmental stage to the ageing process) and cultural contexts (illiterate/literate societies, professional activities, technological systems), the brain, behaviour and culture are intimately entwined, and influence one another in cumulative ways. More specifically, and importantly in the context of this article, the brain itself is a dependent variable, shaped by behaviour and culture, and does not function in an environmental vacuum, being subject at all times to constrictions and dispositions (Li, 2008). As Baltes and cols. point out, the cultural conditions of the environment are as important for brain development as the presence of oxygen (Baltes, Rösler, & Reuter-Lorenz, 2005, p. 21). Philosophical materialism offers a materialist alternative to both monism and dualism, according to the perspective set out in *The myth of the creator-brain. Body, behaviour and culture* (Pérez Álvarez, 2011), based around the argument and decisive proof of brain plasticity.

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