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Mind *vs.* Brain: The Cyberpunk Dissociation

ABSTRACT
This study deals with the cognitive science issue of mind vs. brain functioning. In terms of cognitive neurology, psychology and philosophy, it seeks to depict an image of the mind-brain-body relation which contradicts the "Unitarian" position. In order to show that the brain can operate without the mind's knowledge, and even make decisions against the mind's resolutions, I chose to provide theoretical examples from two main cognitive areas of research (the *computational theory of mind* and the *information pattern theory*) and fictional examples from cyberpunk literature (Bruce Sterling and Rudy Rucker). Both cognitive theories allow us to understand the brain as a computing organ (the *hardware*), whereas the mind is regarded as its unfolding of programs (the *software*). As for cyberpunk fiction, it illustrates several post-human robotic and cyborgic dissociations of the mind-brain-body traditional unity: either the brain operating outside the body, or the mind operating outside the brain.

KEYWORDS
Cognitive Science; Neurology; Computational Theory of the Mind; Information Pattern Theory; Cyberpunk Fiction; Bruce Sterling; Rudy Rucker; Post-Human Condition; Mind-Brain Dissociation.

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One of the most consistent debates in recent cognitive science, particularly in cognitive neurology, psychology and philosophy, relates to a fundamental question: can the mind be split from the brain and, as a result, "deposited" and studied away from its recipient? Or else to phrase this in medical terms, can the non-physical entity of the mind be separated from the physical entity of the brain, in order to get a clearer view of its processes?

Although, traditionally, mental activity and brain activity are considered to be one and the same thing, while subjective experience remains forever connected to and dependent on the physiological organ that produces or shelters it, during the last four decades, numerous theoretical studies and fictional contributions (based on substantial neurological data provided by brain imaging techniques) convincingly brought forward results contradicting or even reversing the opinion that there is no such thing as a "mind functioning outside the brain" or a "brain functioning outside the body". As this study will try to demonstrate by means of neuropsychological information and fictional illustration (extracted from cyberpunk literature), the living brain could be separated from the mind, and even from the human body. Moreover, well shielded from the outside world by its strong, encapsulating skull, it will often do things that the mind is neither in control of, nor aware of.

In terms of the dissociation model, the mind vs. brain issue can be tracked back to two main scientific theories: the *computational theory of the mind* and the *theory of information patterns of the mind*. Both are elaborated after 1980 and need to be seen as mutually beneficial. Since these theories rely on a computer-based model of the mind-brain activity, they can be perceived as part of a larger cyborgic psychological and philosophical view on the post-human condition.

The *computational theory of the mind* was developed by cognitive neuropsychologists, such as Stephen Michael Kosslyn (1980; 1983), as well as by philosophers such as Daniel C. Dennett (1978; 1981, with Hofstadter) or Douglas R. Hofstadter (1985; 1981, with Dennett), who added their personal expertise to the field. Hofstadter, for instance, was specifically interested in finding answers to the endless paradoxes of the mind, embodied in self-referential sentences, drawings or musical parts – a most challenging issue, but with less consequence to the arguments of this study.

In Stephen Michael Kosslyn's view in *Image and Mind*, mind imagery results from a brain activity that is similar, in many ways, to that of a computer (1980: 5-6). At the top of this process of imagery production, maintenance and representation, the mind is conceived as a complex system of computational operations generated by the neural computer of the brain. To put it in another way, for Kosslyn, the brain is the computer of the human body, while the mind is its succession of programs. Both enable us to solve each and every problem that comes to our attention, in order to find the best solution for our individual survival. In order to provide arguments for his neuro-computational assumption, Kosslyn builds up a theoretical model of image-formation processes, in which mental operations are compared to and described by computer functions (FIND, SCAN, ZOOM, ROTATE and so on) showing the same kind of properties as a computer (indication, configuration, integration, repositioning, reorientation, alteration etc.). The better the neural computer works, the more efficient the image-processing quality is (1980: 171). Three years later, pursuing his cognitive research in *Ghosts in the Mind's Machine. Creating and Using Images in the Brain*, Kosslyn suggests that a deconstruction of the mind-brain relation would prove useful to better understanding how mental images succeed in representing absent objects or beings. Consequently, he describes the human brain as a cybernetic device, constantly processing mind programs during one's lifetime span.[1]

Kosslyn's idea, almost chronologically coincidental with that of mathematician and fiction writer Rudy Rucker, author of several cyberpunk novels on the mind-brain computational relation, is illustrated in the cyberpunk fiction of the eighties and nineties of the 20th century by the *human computerized upgrading theory*, described by writer Bruce Sterling in his novel *Holy Fire* as "*posthuman self-actualization*" and "*the software functioning of the soul*" (1997: 70; 330). Deconstructing and displacing the location of mental activity, while conceiving it as a computerized derivation of the human brain, is also a key point of the cyberpunk theories of mind-brain-body dissociation in Sterling's novel *Schismatrix Plus* (1985). Here, one of the characters, the cyborg-woman Kitsune, casually tells her lover, Lindsay, that, through cyber-surgery, her sexual organs have been replaced by a sample of her brain tissue, thus placing the computerized center of pleasure (initially situated in the brain) directly in her vagina (1996: 34).

Later on, in his book with Olivier Koening, *Wet Mind. The New Cognitive Neuroscience* (1992), Kosslyn describes the two main computational cognitive ap-

proaches to the mind-brain issue (the *Dry Mind* approach and the *Wet Mind* approach), seemingly shifting his research interest to the latter. In the *Dry Mind* approach, specific to cognitive psychology, the central metaphor is regarded to be the computer:

> Just as the information processing operation in a computer can be analyzed without regard for the physical machine itself, mental events can be examined without regard to the brain. This approach is like understanding the properties and uses of a building independently of the materials used to construct it; the shapes and functions of rooms, windows, arches and so forth can be discussed without reference to whether the building is made of wood, brick or stone. (1992: 4)

In contrast, in the *Wet Mind* approach, specific to cognitive neuroscience and backed up by magnetic resonance imagery and computerized scanning of the brain, "[…] *the mind is what the brain does*: a description of mental events is a description of brain function, and facts about the brain are needed to characterize these events." (*ibid*.)

As a result, the *computational theory of the mind* takes two separate courses of action: one separating the *hardware* of the brain (the living computer) from the *software* of the mind (the processes derived from the living computer), in order to psychologically and philosophically understand their differences in decision-making, and the other superposing *hard* and *soft*, so as to neurologically explain the nature of information processing that allows the brain to produce and externalize human behavior (1992: 50).

Summing up Steven Michael Kosslyn's early cognitive research during the last decades of the 20th century, one might ask: can the computerized theoretical model of the brain provide a satisfactory answer to the problem of mind-brain splitting? Can the human brain be successfully separated from its cranial shelter, without altering the mind processing events taking place in or outside their physiological recipient? And, even more daring, could we even think of (regardless of the fact that we still disagree on whether we "think" with our brains or with our minds) reshaping the brain, after detaching it from the body, such as the hard of a computer can be detached from its base unit, and, in the process, preserve and copy its most valuable item: the information processes of the mind?

Since the eighties, this both philosophical and neurological question has been addressed by numerous theorists, logicians, medics, AI researchers and robotic scientists. For instance, the famous physicist Steven Hawking can be regarded as the living proof of Daniel C. Dennett's mind experiment *Where am I?*, developed in *Brainstorms. Philosophical Essays on Mind and Psychology* (1978). In *Where am I?*, Dennett suggests that a schizophrenic deconstruction of the unified body-brain-mind concept, based on a cyborgic model that would hypothetically work by separating the brain from the degradable body and the mind from the degradable brain, might just solve the problem of conscience preservation: as long as body/ brain disposal does not influence the process of information pattern transmission and maintenance, our human individuality can be safeguarded (1986: 310-23).

Dennett's philosophical experiment and the questions that arise from its troubling conclusions may just be mirrored in the location and identity issues of real postmodern *medical human cyborgs*, such as Steven Hawking. Struck by a motor neuron disease, the famous quantum physicist is unable to speak or move more than his fingertips, but the cyborgic, prosthetic *engre-*

nage that completes his deteriorated body enables him both to express his thoughts and to verbally materialize them. *Via* a voice generator, a speech synthesizer called *SGD* (a sophisticated device connected to the physicist's body and to its computerized terminal), Hawking's brilliant imprisoned mind in a formidable imprisoned brain in a paralyzed, degraded body is able to communicate (and communicate itself/ its self) with the outside world, as if nothing were wrong with the ensemble.

As surprising as this may seem, Hawking's living cyborg condition testifies to a functional dislocation of the unified identity that a human being is supposed to have, be accustomed to and rely on. However, this dislocation works for the better, enabling Hawking to perform his usual tasks: the activity of the brain is computer-monitored, the "voice" of the mind is generated/ processed by a machine (the *Speech Generating Device*), while the movements of the body are enabled by another machine (a complex wheelchair, perfectly suited for the scientist's needs).[2]

In terms of the computational and cyborgic theory of the mind, Hawking possesses and does not possess his own self. His half-machine, half-human condition makes him the owner of an *out-of-body subjectivity*, prolonged in a prosthetic way, from its captive inside to the living outside world, by means of computerized cables, joysticks and keyboards. The visible, bodily Hawking, made out of flesh and bones, is defined by the digital, *out-of-bodily* engineered Hawking, and vice-versa. Humanly deconstructed and cyborgically reconstructed, Hawking's fractured existence (which I may call, using a psycho-technological term, *schizo-prosthetic*) enables us to catch a glimpse of what might just happen when we try to fulfill a seemingly impossible task: to successfully separate the brain from the body and to successfully split the mind from the brain.

The issue of splitting brain and mind (generally, through a "brain in the machine" transplant) is frequently dealt with by cyberpunk writers in the eighties. In their fictional perspective, the mental state can easily be separated from the activity or even the location of the brain, thus giving birth to new forms of conscience and meta-conscience. Such is the case of Lindsay, Bruce Sterling's exiled inter-galactic character in the novel *Schismatrix*, who feels his mind slowly falling into its "second mode of consciousness" (1996: 14).

Finding the neural location of conscience and defining one's self when the brain and mind supposedly unified activity malfunctions, in a futuristic society where robots and humans become conflicting entities, seems also to be Rudy Rucker's main fictional concern. In his *Ware Tetralogy*, gathering the novels *Software* (1982), *Wetware* (1988), *Freeware* (1997) and *Realware* (2000), Rucker depicts a 21st century hyper-technological society in which robots created by humans gradually became autonomous and, therefore, try to explain their purpose in terms of neural and mechanical consciousness. Not being able to achieve this goal on their own, they proceed to dissect their human creators, in order to find out the location of their individual and collective essence (the soul, *aka* consciousness) and then extract it from its living carcass, so as to "rebuild" it in a freshly engineered robotic body. The essential part of the process is being able to separate *mind* (*the information-pattern bearer*) from *brain* (*the physiological, disposable computing unit that contains the mind*). Hence, the mind is treated as *software*, while the brain is regarded as *hardware*, the robots always favoring the first:

> The soul *is* software, you know. The software is what counts, the habits and

the memories. The brain and the body are just meat, seeds for the organ tanks. (Rucker, 1997a: 66)

Rucker's main character in *Software*, brilliant scientist Cobb Anderson – the man who invented thinking robots and now provides them with the soft of his mind, in order to be implanted in other humans or robots – also holds a theory of mind-brain dissociation, which relies on strongly conflicting the benefits of bio-software and hardware use:

> A robot, or a person, has two parts: hardware and software. The hardware is the actual physical material involved, and the software is the pattern in which this material is arranged. Your *brain* is hardware, but the *information* in the brain is software. The mind…memories, habits, opinions, skills… is all software. (*ibid*.: 112)

In Rudy Rucker's view, the human body merely acts as a disposable recipient for the brain organ, which can be extracted from its biological carcass and re-implanted into another. In the second stage of this reverse-engineering process, which relies on robotically dissecting and rebuilding the human creator, the brain itself becomes a disposable part, as long as the mind can be isolated and separated from its superfluous computing biological container.

Later on, in two of his science-fiction novels from the years 2000, *Postsingular* (2007) and *Hylozoic* (2009), Rucker provides the mind-brain dissociation theory with an even more futuristic conclusion. In *Postsingular*, there is no stringent necessity to extract the mind from the brain, since all of humanity's minds are now inter-connected, by means of viral, invisible neural nano-computers, called *nants*. These prolific, self-reproducing *nanite ants* freely circulate through each human body:

> Luty believed the future lay with nants: a line of bio-mimetic self-reproducing nanomachines that he'd patented. (Rucker, 2009: 20)

As a result, information is instantly shared by billions of people and each individual thought or action (from eating, to sex) is universally broadcasted on each and everyone's mental screen in real time frames.

The process of universal neuro-cybernetic mind connection is described in *Hylozoic* as "*teeping*", a form of neuro-digital tapping in and telepathic peeping which enables one person to instantly seek the mind images of another. "I want to explore the ebb and flow of shared identities." says one character, metanovel writer Thuy, "Conscious minds used to be like isolated fireflies in the night. And now the light is everywhere." (Rucker, 2010: 94)

Along with the *computational theory of the mind*, the second main scientific theory that could shed some light on the mind-brain dissociation problem is the *theory of information patterns of the mind*. It can be tracked down to the middle of the 20th century and to experiments such as Allan Turing's – only to quote his famous "Turing Test", meant to separate human beings from machines, in terms of conscious vs. mechanical information processing and response –, or to those conducted by informatics pioneers Claude Shannon and Norbert Wiener.

However, its fundamental guidelines are to be found later on, in the eighties and the nineties, in two of Hans Moravec's books on robotics and AI: *Mind Children: The Future of Robot and Human Intelligence* (1988) and *Robot: Mere Machine To Transcendent Mind* (1998). Mora-

vec's main assumption is that human beings exist in the form of *information patterns*, rather than of *bodily presence*. Whatever defines me as a human being – seems to be the author's strong statement – no longer relates to my flesh-and-bones carcass, which is subject to deterioration and, therefore, in time, will inevitably become unusable. On the contrary, what is specific to my ephemeral, but intense existence in this universe (thoughts, memories, feelings, emotions, the ability to rationalize or to experience the sophisticated processes of consciousness and self-examination) exclusively depends on the information encrypted in my mind.

Moravec's way of illustrating his theory is quite similar to Daniel C. Dennett's and raises the same questions regarding the location of conscience and the repositioning of subjectivity outside the body. *Via* a mental experiment that resembles Dennett's 1978 one, the robotic scientist imagines a situation in which the conscience of a living human being can be extracted from the brain (through a complex downloading process) and then uploaded into a computer; however, during the operation, the brain is irreversibly destroyed by the robotic doctor which (or should we say: *who*), much alike as in Rudy Rucker's cyberpunk novels, performs the surgery.[3]

Basically, Moravec's dissociation argument relies on three *what if*'s: 1. *what if* the human mind would be a set of information patterns?; 2. *what if* this set of information patterns could be extracted from the living brain?; 3. *what if*, once extracted, the information patterns could be preserved and then recharged (much as we recharge an electrical battery) into a new, improved recipient? Should any of these *what if* conditions fail, his theory would not be validated.

When closely examined, however challenging from a philosophical or bio-technological point of view, the consequences of Hans Moravec's mental experiment seem quite disturbing from a moral/ethical perspective. If transferring conscience (encrypted in the information patterns of the mind) into a computer is feasible, then why not see the human body as "disposable"? And, if the human body is accepted as "disposable", why not "dispose" of it in "due" time, in order to provide the mind (and its neural information patterns) with a "better host" and some optimal, "reliable" functioning conditions? The ethical implications of such a chain of logic are, to say the least, troubling.

In *Mind Children*, Moravec's dissociation theory is argued with both passion, and ration. The author seems undisturbed by any moral criticism, since his both philosophical and bio-technological goal is to achieve human immortality by means of mental pattern preservation:

> The pattern-identity position has clear dualistic implications – it allows the mind to be separated from the body. (1988: 119)

And, a couple of pages later:

> More radically, we could "download" our minds directly into a body in the simulation and "upload" back into the real world […] (*ibid.*: 121)

In an envisioned post-biological world, gaining immortality through robotic and cyborgic surgery applied to the body has to prevail over moral considerations, since its purpose is to improve human life.

The main issue in Moravec's experiment (the achievement of immortality by transferring human thoughts from their natural "container" – the brain – to an artificial recipient – the silicon chip – where they could be safely, more efficiently and less cost-productive stored) remains debatable in

bio-ethical terms, although technologically and psychologically attractive (for instance, in the prospect of post-human cloning). His assumption, based on the intuitions of Shannon, Wiener and, in general, of the pioneers of cybernetics who participated in the fifties in several annual scientific meetings called *The Macy Conferences* – namely, that the human being is nothing else but a *message* deposited in a biological *ensemble*, but not intrinsic to it – was therefore severely criticized from an ethical perspective, as well as in terms of the democratic techno-cultural policies of postmodernity.[4]

Nevertheless, the moral issue is addressed by the author ten years later, in *Robot: Mere Machine to Transcendent Mind*. Although mainly associated to mental experiments and computer simulations, and not to the real biological world, the mind-brain-body dissociation problem is now dealt with in a more prudent way, as if Moravec had sensed that, in the future, its consequences could become far from completely harmless:

> […] mistreating people, intelligent robots or individuals in high-resolution simulations has greater moral significance than doing the same at low resolution or in works of fiction, not because the suffering individuals are more real – they are not –, but because the probability of undesirable consequences in our own future is greater. (2000: 199)

Even so, lately, the *information pattern* theory in the field of human and artificial mind research gains more and more ground. Cognitive psychologists and philosophers use it to discuss the nature of conscience, cognitive neurologists to pinpoint the location of conscience. Despite the criticism constantly brought forward by "Unitarians" such as Dreyfus (1979; 1992), who argue that human intelligence can not exist outside its biological body, both the thesis of splitting the traditional mind-brain-body relation (through a succession of downloads), and the one of the disposable body (no longer regarded as a mandatory condition for human existence) receive a great deal of praise and support.

Perhaps the most spectacular support comes from one of the world's leading authorities on AI and the main developer of the first print-to-speech reading machine for the blind, Ray Kurzweil. In Kurzweil's view, expressed in his book *The Age of Spiritual Machines* (1998), the road to immortality on which humanity cautiously embarked a couple of decades ago is filled with extractable biological software:

> Actually, there won't be mortality by the end of the twenty-first century. Not in the sense that we have known it. Not if you take advantage of the twenty-first century's brain-porting technology. Up until now, our mortality was tied to the longevity of our *hardware*. When the hardware crashed, that was it. […] As we cross the divide to instantiate ourselves into our computational technology, our identity will be based on our evolving mind file. We will be software, not hardware. (1999: 162-163)

However, Kurzweil's argument in favor of artificial intelligence is not 100 % identical with Hans Moravec's theory or Rudy Rucker's fictional illustration depicting conscious, autonomous robots, equipped with bio-artificial brains and experiencing sudden changes of temper (therefore, personality). On the one hand, as well as in Moravec and Rucker's works, in Kurzweil's *Age of Spiritual Machines*, human identity relies on the permanence of *software* (the

mind) within a *hardware* (the brain, and the body) that goes on existing, be it in a vulnerable, disposable form. On the other hand, in a slight differentiation from Moravec and Rucker's perspective, Kurzweil does not associate the mind with a *single soft* contained in the brain, but rather with a set of *files* pre-installed in the brain and, therefore, as easily un-installable.

But, for all three authors who theoretically embrace the mind-brain-body dissociation, the process of "downloading" one's identity can not elude a three-way bio-technological process: extracting the brain from the body; extracting the mind from the brain; extracting the soft/ mental files from the mind. Only by following these compulsory steps can one abandon the fragility of the flesh and, consequently, achieve his or her post-human condition. At the end of the road, in a blaze of perpetually undeteriorated information, lies humanity's most wanted terminal state: immortality.

Immortality is also what robots seek – apart from understanding conscience – in Rudy Rucker's cyberpunk novels. In *Software*, the so-called "boppers", complex robots with real, living brains, designed by Cobb Anderson, rebel against the human world because it is made of decaying, therefore unsustainable organic material. Dissatisfied with the conclusion, they start building their own society on the Moon, while offering their Creator immortality. Still, their offer comes at a price: Cobb Anderson gets to be bio-mechanically duplicated into Cobb Anderson 2, in exchange for his original soul. "Preserving your software" is all that the robots are interested in (1997a: 24).

In *Wetware* (1988), the "boppers" have even greater bio-technological ambitions. They discover how to inject bio-human DNA (called *wetware*) in their own software codes. As a result, they become a new form of biological and artificial life, "*meatbops*", ready to build symbiotic human beings (or "*meaties*") in their state-of-the-art labs (Rucker, 1997b: 63).

In *Freeware* (1997), the third novel of Rucker's tetralogy, the "*meatbops*" turn into "*moldies*" (bio-artificial entities made of plastic and algae genes), paradoxical forms of life displaying bodies with variable geometry and minds with alternative states of consciousness (Rucker, 1998: 4-5).

Realware (2000), the novel that concludes Rucker's robotic cycle, deals with an alternative reality of mind, matter and flesh, in which strange four-dimensional beings and shape-shifting alien creatures called "*Metamartians*" interact with the people on Earth. The "*Matamartian*"'s most spectacular asset is a device called "allas" which enables the mind of a human or a robot to take control over physical matter. Consequently, brain, mind and matter are no longer connected in a stable, coherent operational relation.

From a cognitive science neurological perspective, both the *computational theory of the mind* and the *theory of information patterns of the mind* testify to a non-unified model of mind and brain, of mental states and brain activity. Through non-invasive brain imaging and magnetic scanning medical techniques, such as functional magnetic resonance imaging (*fMRI*), diffusion imaging (*dMRI*), magnetic encephalography (*MEG*) or electric encephalography (*EEG*), researchers are now able to "see" what is happening inside the brain (often in situations or during activities when the subject is not mentally aware of what his or her brain is doing) and in which precise location. By measuring the parameters of the blood flux and the electro-chemical responses to specific stimuli in different parts of the brain, scientists are getting closer to pinpoint the location of yet undetermined areas of human decision and awareness, such as conscience.

Perhaps the most spectacular recent research in this area is that conducted by the *Human Connectome Project* (or *HCP*), a huge scientific project launched in July 2009 with the participation of 33 scientists and doctors from several main universities and hospitals in the United States (including Harvard, UCLA and Massachusetts General Hospital) and the financial support of the *National Institutes of Health*, the main U.S. agency for bio-medicine. The project is meant to last around 5 years and consists of scanning the brains of 1200 healthy human subject, in order to achieve the human brain's complete map of neural "circuitry". Mainly by means of diffusion spectrum imaging (*DSI*) and diffusion tensor imaging (*DTI*), the researchers of the *Human Connectome Project* attempt to find the "roads" followed by water molecules inside the neural networks of the brain, specifically inside the axon's "tubules". As a result of examining the patterns of tiny molecules of water in trillions of synapses and billions of neurons, scientists of *HCP* even hope to discover the precise location of conscience, somewhere between the two cerebral hemispheres, in the parietal medial cortex.[5]

In terms of the mind-brain dissociation theoretical perspective, more and more recent cognitive neurology and cognitive psychology contributions show that, much more frequently that we might think (with the mind? or with the brain? with both at the same time? or with each one, separately?), the brain performs specific activities that the mind is not even aware of. This tiny, hard-working physiological organ[6] often separates itself from the mind and makes decisions of its own.

In his book, *Making Up the Mind. How the Brain Creates our Mental World* (2007), British cognitive neurologist Chris Frith describes three situations in which the brain "knows" things about the outside world of which the mind is not aware: brain damage, electrical stimulation of the healthy brain and drug stimulation of the healthy brain (2009: 36). In these three situations, the brain either malfunctions (the first case) or is fed with false information (the last two cases), which results in a "false knowledge" and a distorted/ mistaken picture of reality (*ibid.*). The process of splitting mind from brain (or, better said, mind experience from brain activity) and of "falsifying" information is quite simple: the senses feed the brain information extracted from the outside world (physical reality), but the damaged organ interferes with this transmission and provides the subject with a false/alternative model of the outside world.

For instance, patients experiencing severe memory loss may identify and repeat the physical activity they started to learn the previous day with the help of an examining doctor, but may not be able to remember the doctor's face or name (2009: 27). In this specific case, illustrative for a medical condition of the damaged brain called *prosopagnosy* (the subject's ability to identify a face as being human, but the impossibility to determine who it belongs to), our mental perception of the outside world is completely different from the patient's one. To sum up Chris Frith's theory, first the brain gets deteriorated, then the mind is "convinced" of its truth (in fact, a false representation of the outside world). As a result, we actually do not have a straightforward, accurate access to the external world: "direct" representation in the mind is merely an illusion created by the brain (2009: 40).

Frith's neurological mind-brain dissociating examples (including the analysis of optical illusions and their effects on true vs. false human knowledge of reality) can be extended to the realm of *dreaming activity* – during profound sleep, the mind is not aware of what the brain is doing – and to that of *unconscious rewards* – which the

mind rejects, but the brain dictates, in order to obtain pleasure, *via* the activation of "happy hormones" flows, such as serotonin or dopamine. In the first case, despite a strong cerebral activity during sleep (testified to by the monitoring of the brain with a helmet with electrodes), we remember only 5 % of our dreams. Therefore, one might say that, while dreaming, the brain performs a set of operations (including decision-making inside the dream) which the mind is not conscious of. In the second case, while the mind strongly opposes an action, the brain orders it, through what I may call *the hormonal blackmailing of the mind*. "*You take this course of action, and I will reward you with an irresistible flow of dopamine!*" seems to be the brain's slogan addressed to the mind.

For example, after a hard week's work, we enter our favorite sporting goods shop, having in our pocket just the amount of money needed to pay the rent. The rent is due to be paid this precise afternoon, no delays accepted. The mind tells us not to spend the money on any item exhibited in the shop, as it is urgently needed by the tenant. However, this course of action is hardly motivating for the brain, since it makes it provide the body with stress hormones: cortisone, epinephrine etc. Or, as all of the cognitive neurologists, psychologists and philosophers tell us from the eighties until today, the human brain seems to have been genetically and evolutionary "programmed" to ensure us with *optimum survival conditions*, as well as with a *state of well-being/ pleasure/ comfort*. Neurologically, this state translates itself into one relentless operation: the flow of chemical rewards and prizes.

The brain therefore does what the "brain wants" or what the "brain likes", separating itself from the mind and demanding/ generating bodily rewards, either through *recognition* (for instance: looking at someone and being looked at; smiling; flirting, and so on), or through *acquisition*. Consequently, although we "know" that we must not spend our money on anything else but the rent, we leave the sporting goods shop with the latest hardshell mountain jacket in our bag. Flat broke, but happy, we experience the euphoria of having "chosen" (that is, of leaving the brain the decision to choose) the "proper" course of action which instantly rewarded our body with pleasurable chemicals. The mind will have its own way later on, demanding a rational explanation, together with the vocal, infuriated landlord; but the brain will pretend to have no part in this disagreeable *reglement de comptes*.

The final question in all these examples of mind-brain dissociation may be: how many things does the brain do without us (or our mind) knowing them? The answer is: quite a lot. Our senses provide our brain with reliable or unreliable information, but, in both cases, the brain selects only what seems relevant to it in terms of optimum survival insuring. As a result, the mind often gets convinced of the "reality" of faulty information provided by the selective brain and performs accordingly, as if it were able to somehow detect the "mistake", but not strong enough to correct it.

Optical illusions, change blindness reactions (for instance: getting used to a specific road sign in a specific place and not noticing it has been changed overnight) or *unintentional blindness reactions* (for instance: looking at your mobile phone for the time, seeing a new text message icon, reading the message, putting the phone back into the pocket, and completely ignoring the time on the display) are some of the most convincing examples that mind and brain do not always concur in decision-making. In *optical illusions*, such as the "flipping ambiguity" type (the "Duck-Rabbit" illusion, or the "Old Lady-Young Mistress" illusion), the mind is fooled both by the optical system

and by the brain: its simply can not hold both representations at the same time. Actually, the dissociating brain acts here more like an automatic Word "spelling and grammar" checking program, correcting the mind's received information, in order to make it more useful to the human subject and, therefore, better suited for his or her survival.

Such internal "errors", and their corrections, are being thoroughly analyzed by optical illusion expert Richard Gregory, in two of his famous books on the psychology of seeing: *Eye and Brain. The Psychology of Seeing* (1966) and *Seeing through Illusions* (2009). In Gregory's view, the "false"/ alternative information fed by the eyes and the brain to the mind is related to two main internal upsets, the *hardware* (*neurological*) upset and the *software* (*cognitive*) upset:

> It turns out that there are several kinds of illusions. Some are due to upsets of the physiology of the nervous system; others, very differently, are like incorrect hypotheses in science – due to inappropriate assumptions, or misplaced knowledge. The first kind of illusions may be compared with computer hardware errors; the second kind with bugs of software […]. (Gregory, 1998: viii)

Moreover, during these semi-unconscious processes of dissociation involved in *optical illusions, change blindness reactions* and *unintentional blindness reactions*, some cortical areas of the brain tend to get more electrical impulses, while others are being slowed down or even shut down. This also requires a great amount of energy consumption from the brain.[7] Should we want to smile at someone nice we meet for the first time and begin with a real, true smile and then fake it, because we suddenly seem not to like that person anymore, two different cerebral areas will get alternatively activated and shut down: the cortical area responsible with emotion generation (the true smile) and the cortical area responsible with movement control (the fake smile). Not only does the brain often do what the mind does not "know" about, but it sometimes does things that it, itself, is not "aware of".

Ultimately, as is the case with cyberpunk fiction characters, the mind-brain dissociation issue may be resolved by partly or completely abandoning the human biological condition. In Bruce Sterling's short story *Cicada Queen*, from *Crystal Express* (1989), "cognitive metasystems" and alternative ways of embodiment take over the traditional human mind-brain-body system:

> And, conversely, Mechanists are slowly abandoning human flesh in favor of cybernetic modes of existence. (1990: 49)

In another story included in the same volume and called *Spider Rose*, the protagonist has the ability to chemically alter her normal body and mind condition, tuning them to the most suitable parameters:

> Nothing was what Spider Rose felt, or almost nothing. There had been some feelings there, a nexus of clotted two-hundred-year-old emotions, and she had mashed it with a cranial injection. […] Rose was clever. She might have been insane, but her monitoring techniques established the chemical basis of sanity and maintained it artificially. Spider Rose accepted this as normal. (1990: 29)

And, in a third story from *Crystal Express*, *Sunken Gardens*, the protagonist, Mirasol, is able to alter her perceptions by means of cerebral tuning. This chaotic-ordered, Prigogine-like operation generates virtual mind

patterns and body reactions/ behaviors which no longer resemble the "human"-like ones:

> Mirasol watched the winds through the fretted glass of the control bay. Her altered brain suggested one pattern after another: nests of snakes, nets of dark eels, maps of black arteries. (1990: 85)

All these fictional examples implying a dissociating body-mind-brain condition may be analyzed not only from a human neurological perspective, but also from a cybernetic post-human point of view.[8]

As a conclusion, neither the *computational theory of the mind*, nor the *information pattern theory* can satisfactorily explain what happens in the brain, when it operates beyond the borders of the mind. However, neurological research in the last four decades, as well as cyberpunk fiction anticipations, provided us with useful tools in getting a step closer to mapping the human brain and understanding its functioning in or outside the mind's frame. When the hypothetical map of the brain's "circuitry" will eventually be completed, some of the most troubling questions of cognitive psychology and philosophy may get their answer: what is conscience? where is it situated? what is its purpose? will we be able to preserve it?

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Notes

[1] In Kosslyn's own words: "We can speak of the mind as being embodied in the brain, just as we speak of a program as being embodied electronically in the computer; mental events – thinking, remembering, and the rest – can be understood in terms of a symbolic description of the stored information." (1983: 19)

[2] For more information regarding the computing devices and software used by Steven Hawking, see: www.hawking.org.uk/the-computer.html.

[3] See, among other explanations: Moravec (1988: 84).

[4] See, for instance: Hayles (1997: 186-87).

[5] For further medical details and a spectacular brain mapping digital illustration, see: www.humanconnectomeproject.org.

[6] According to neurologists, the brain represents only 2% of the human body, but consumes almost 20% of its energy. See, among others, Frith (2009: 9).

[7] Just for powering up the process of seeing, the brain uses "about 4 per cent of the energy of the food we eat" – Gregory (2009: 3).

[8] See Manolescu and his post-human condition techno-cultural analysis (2003: 165-184).