

On the Neuro-Turn in Education: From Inside Out

by

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Abstract

On the Neuro-Turn in Education gives a lived account of my exploration of quantitative research in education at the intersections of neuroscience, cognitive science, and cognitive psychology. I argue that existing quantitative studies fall short of meeting all (if any) of transdisciplinarity's multiple dimensions, and I assert that such research is, in essence and methodology, an expression of the *neuro-turn* in education. This turn has reinforced a view of education, even if largely implicit, as a closed and mechanistic system—a perspective that so far has prevailed in our society over the view of education as a living process.

I have met with transhumanists gravitating toward the outer edge of the neuroscience of learning, in the stratosphere of artificial intelligence, where the prospect of becoming smarter overshadows the wish to become wiser. In that respect, neuroethics - the most recent subdiscipline of applied ethics - rises from the paraxial fact that neurotechnologies are generating ethical challenges while at the same time promoting a neuroscientific understanding of ethics. I argue that ethical questions related to “my brain” are not distinct from ethical questions about “my self” in relation to others, a fact that a subdiscipline risks missing because it focuses on the particulars of the biological explanation of ethics, at the cost of the bigger picture: the complexity of the societal constructs involved in elaborating our moral judgments. I reclaim the richness of my embodied phenomenological being across an inside–out continuum from self to others, and from human to non-human others; and I explore intersubjectivity as resonance at both the philosophical and the organic levels.

Finally, I reflect on how, as a philosopher of education, I can be an active participant in sharing with educators and all stakeholders a redefinition of the purpose and aims of education. Central to such dialogue is an urgent need to shed light on toxic metaphors that turn humans into data. By illuminating such issues, I hope to initiate our homecoming to a posthumanity embedded in the fabric of the world.

Keywords: Neuro-turn; Neuroethics; Transdisciplinarity, Transhumanism; Posthumanism; Philosophy of Education

Dedication

For all this time taken away from our life together, all I can say is

Thanks for your peaceful presence all along

I'm back

And so happy to be home

For Garry, with love

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Prologue

Qualitative writers are off the hook, so to speak. They do not have to try to play God, writing as disembodied omniscient narrators claiming universal and atemporal general knowledge. They can eschew the questionable metanarrative of scientific objectivity and still have plenty to say as situated speakers, subjectivities engaged in knowing/telling about the world as they perceive it.

(Richardson & St-Pierre, 2005, p. 961)

I became a college teacher in my early 30s after showing up at the door of a small college near Montreal on a September morning to help a friend during a Biology 101 lab. As students were introducing themselves, asking questions, talking to each other and filling the room with so much life, I was inundated by the realization that all that would matter were interpersonal, relational, interactive experiences *between* unique individuals and *within* shared questions. In this awe moment, suddenly, education was not about learning facts but about creating meaningful networks. Why this view came to me at that moment is a story in itself, but let me say for now that it was not something that could be derived from previous experience: My own schooling had exposed me primarily to competition and individualism.

It would be years before I would run into the work of Evan Thompson's describing "*living as cognition*", his work elegantly bridging phenomenology and cognitive neuroscience. That September morning when I became a teacher, it did not matter that I could not put words on the overwhelming emotion: the recognition of the fundamental relational nature of education was to stay with me. I have been able to look back at my own training as a scientist and ask some hard questions. Maybe it was a reflection of the time, but I found it deeply puzzling that I had gone through an undergraduate degree and a master in sciences without any exposure to philosophy—not even philosophy of science, let alone ethics or philosophy of education. There was one course offered in Bioethics during my program - but it was optional and I went for Drawing instead.

When I moved from Montreal to Vancouver in 2008, it opened up an opportunity for me to step back from teaching and to consider re-entering graduate studies after 20

years as an educator. I was aiming primarily at deepening my interest in philosophy of education and also in exploring the drama of the 'two cultures', this divide between science and the humanities that seem impossible to bridge. It was a fairly straightforward project at that point but I was far from realizing that I was going to find myself as the main character of the drama of the 'two cultures'. I would have to first get lost at sea and slowly and patiently row back to a new shoreline and would be forever transformed in the process.

First, I was not prepared for the degree of freedom my PhD program offered. When came time to narrow down my research question, I realized that, in opposition to research done in natural sciences conducted in a lab setting where you busy yourself investigating a topic the size of a needle head under direct daily supervision of a professor, I was going to be the experience and the experimenter – a phenomenological being.

Second, my exploration of new perspectives was not happening without fear - of the unknown and foreign land. In a very unconscious way, I ran for safety, for familiar ground and decided to do my research on how scientific inquiries, more specifically neuroscience, was going to *enlighten* educational research by applying its methodology to issues in education. It sounded like something I would be able to think about, *from a safe distance, in a rational way.*

Here is what followed: I started hanging out with neuro-educational researchers, going on academic conferences on that topic and also at events organized for teachers by the new guru surfing on the wave of the neuro-turn. Brainhood was the new personhood. In all these events and through the literature generated by this emergent field, neuroscience always seemed to be presented as the new holy grail for education, a suspicious standpoint, I found, that was going to bring about my first wake-up call: The transformative process and personal journey I originally wanted to pursuit had nothing to do with this race for a magic bullet.

In conferences I met with transhumanist - scientists actively out there to free humanity of what they describe as the limitation of our human condition. Worry by the influential power, both political and economical these thinkers were representing, I

decided to join the International Neuroethics Society (INS) and to focus my research on looking not so much into neuroeducational researches but on their ethical guideline and underlying framework. This involvement in INS took me, in 2013, to their Annual Conference in San Diego where I was presenting a poster titled: *Philosophy of Education and Neuroethics: Merging focuses* to the hundred fifty participants. At the Society for Neuroscience (SfN) conference happening next door, no philosopher, none, was taking part in the conversation of the 30 000 attendees. I felt the relentless march forward of neuroscientific development. Neuroethics was not the guardian of wisdom in the neuro-turn as I thought and hoped it would be. That day, in San Diego, sitting by my poster board in the middle of a half-empty, anonymous conference room, I said No! to the disembodied world view of mainstream scientific endeavour, to dualistic epistemology and to a world where the rational eats up the personal, the emotional, and the unique experience of being-in-the-world in full intersubjectivity. I came back to Vancouver and unplugged from graduate studies with a liberating sense of having found what I was looking for: I focused on appreciating and celebrating my personal journey as a teacher and teacher educator. When questions felt better than answers, I return to academia to write - writing as a method of inquiry – writing about my journey, from the Enlightenment to the front step of Posthumanist era. My research became a festive endeavour.

If I sometimes worry over the fact that nowhere in my research and reading, have I found examples of society choosing wisdom over technological illusion of power – because we can, does that mean we ought to do it? – I'm also feeling more confident that for posthuman, empathy and responsibility to others can inspire a world of difference.

I will be accompanied, all through my dissertation, by the words of a poet, Brenda Shaughnessy, whose work I have run into at the right place and time. Her words never left me. Her words translate human experience in a peculiar way: resisting interpretation but not feeling. It will act as a lifeline at the end of each chapter – poetry does not ask for permission before entering our heart.

In **Chapter 1 On the neuro-turn in education**, I will describe my exploration of quantitative research in education at the intersections of neuroscience, cognitive science, and cognitive psychology. Such attempts are often presented in the literature as examples of transdisciplinarity in the field of educational research, but I argue that these studies fall short of meeting all (if any) of transdisciplinarity's multiple dimensions. I assert that such research is, in essence and methodology, an expression of the *neuro-turn* in education and that instead of helping the emergence of transdisciplinary initiatives, have reinforced a view of education as a closed and mechanistic system—a perspective that so far has prevailed in our society over the view of education as a living process.

In **Chapter 2, Walking among Transhumanists**, I will be walking among transhumanists who are gravitating toward the outer edge of the neuroscience of learning, in the stratosphere of artificial intelligence (AI), the ultimate frontier for the metaphor of humans as machines. This walk will reveal profound fear: of death, of fragility, of love. Fear is a powerful driver for research in neurotechnology, where the prospect of becoming smarter overshadows the wish to become wiser. Here, I will examine the need for an *in-turn*, leading to a better look at our intersubjectivity and ontological being-in-the-world.

In **Chapter 3, Neuroethics: Exploring the rabbit hole of sub-disciplines**, I recount my venture into neuroethics, the most recent subdiscipline of applied ethics currently trying to align the use of neurotechnologies with human value systems. The question rises from the paraxial fact that neurotechnologies are generating ethical challenges and at the same time, promote a neuroscientific understanding of ethics. Upon reflection, I am inclined to think not: ethical questions related to my brain are not distinct from ethical question related to myself in relation to others, a simple fact that a subdiscipline risks missing because it focuses on the particular of the biological explanation of ethics at the cost of the bigger picture – the complexity of societal construct involved in the elaboration of our moral judgment.

In **Chapter 4, Phenomenological being**, I reclaim the richness of my embodied phenomenological being. Across an inside–out continuum from self to others, from

human to non-human others, I explore intersubjectivity as resonance at both the philosophical and the organic levels.

In **Chapter 5, Philosophy of education: Sharing with educators**, I reflect on how a philosopher of education can be an active participant in sharing with educators and all other stakeholders involved in education in defining (re-defining) the purpose and aim of education. Central to such dialogue is an urgent need of shedding light on toxic metaphors turning humans into data and by doing so, begin our coming home to a posthumanity embedded in the fabric of the world.

Chapter 1.

On the *neuro-turn* in education

Overview: In this chapter, I will discuss my exploration of quantitative research in education at the intersections of neuroscience, cognitive science, and cognitive psychology. Such attempts are often presented in the literature as examples of transdisciplinarity in the field of educational research, but I argue that these studies fall short of meeting all (if any) of transdisciplinarity's multiple dimensions. I assert that such research work is, in essence and methodology, an expression of the *neuro-turn* in education and that instead of helping the emergence of transdisciplinary initiatives, it have reinforced a view of education as a closed and mechanistic system—a perspective that so far has prevailed in our society over the view of education as a living process.

1.1. Quantitative quest

This desire for “evidence-based” education has coincided with a period of tremendous progress in the field of neuroscience and enormous public interest in its findings, leading to an ongoing debate about the potential of neuroscience to inform education reform. Although the value of neuroscience research on this front is seemingly promising, collaboration with educators is doomed to failure if the public is not correctly informed and if the research is not considered in an interdisciplinary context.
(Stern, 2005, p.745)

Because I initially approached research in education within an unquestioned, narrow framework, inherited from my previous training as a scientist, it is unsurprising that I was first attracted by quantitative methods. In fact, it was more than a simple attraction: I was looking for a lab, a place to collect data and do statistical analysis, a place where physical phenomena could be measured, dissected, pinpointed, and quantified. A place where I thought learning could be measured and improved, and

teaching could be made efficient. Where was I going to find this type of research in a Faculty of Education? It was 2008, and some research was starting to happen at the intersections of neuroscience, cognitive science, and education (Byrnes, J. P. & Fox, N. A. 1998, Byrnes, J. P., 2001). It was intriguing and fully empirical. Although I had never lived this way—in a disconnected, divided, and rational way—this is what I thought *serious* research had to be. If it is hard for me not to laugh-cry at such an idea today, I find it important to acknowledge the seductive power that scientific inquiry had on me at the time: the way investigating learning processes from behind big data and brain images felt like Icarus flying to close to the sun with wings made of wax. Reckless.

I became immersed in quantitative research in education without realizing that quantifying how we learn at the neurological and physiological levels is the focus of an altogether different field from education, one more relevant to what cognitive science is investigating. Nor did I give proper attention to the *critics pointing at the limitations of quantitative methods in education*, intrigued as I was by the potential interdisciplinary nature of such quantitative research. In that context, I turned my attention to the field of neuro-educational research done at the junctures of neuroscience, cognitive science, and cognitive psychology. It first felt like a space where I could achieve foundational work across disciplines—foundational within the framework of evidence-based knowledge. It was going to be science and the humanities in interaction, in interdisciplinarity, plus the promise of potential transdisciplinarity. I was attracted to this idea of the melting of boundaries between disciplines, envisioning neuroscientific inquiry revisited in a new light, where there would be no such thing as a third-person-type observer but instead a focus on lived experience. I had tackled the notion years before, during my studies in biology, and I was hoping to investigate current attempts at transdisciplinarity. So off I went on this intellectual journey into educational neuroscience, in the realm of Mind, Brain, and Education. I was in for a wild ride.

1.2. The timeframe of the emergence of educational neuroscience

The field I was entering was fewer than 10 years old and had already been given many names, including *neuro-educational research*, *neuro education*, *educational*

neurosciences, the *neuroscience of education*, and *mind, brain and education (MBE)*, all of these terms pointing to the use of empirical methods to confirm best practices in pedagogy. From the start there have been many disagreements over the use of disciplinary terminology, and I still remember the hair-splitting efforts that were made in a particular meeting to distinguish between *educational neuroscience* and the *neuroscience of education*. Harvard's Faculty of Education was actively laying the ground by launching a graduate program called Mind, Brain, and Education, with faculty members including Howard Gardner, author of the famous *Frames of Mind: The Theory of Multiple Intelligences* (1983), Bruno della Chiesa, who edited the two influential OECD publications *Understanding the Brain: Towards a New Learning Science* (2002) and *Understanding the Brain: The Birth of a Learning Science* (2007); the back-cover text of the latter claimed that “[a]n international and interdisciplinary effort will play a decisive role in resolving recurring problems in education.” Kurt Fischer and a team of researchers at Harvard's Faculty of Education have been active from the start in defining the field. In 2007, they offered the following view:

As hidden processes in the brain and body become visible, researchers and educators can begin to observe the biological effects of educational interventions and relate them to outcomes in learning and development. This new approach can simultaneously inform effective practice and build fundamental knowledge about the ways that children and adults learn and develop. (Fischer et al., 2007, p. 1)

Expressed within this quote are both elements that played a catalytic role in providing a context for the emergence of educational neuroscience and its framework: technological advance in brain imaging, and a growing enthusiasm for interdisciplinarity inquiry.

First, brain-imaging technologies had gone mainstream, generating great enthusiasm around the idea that “hidden processes in the brain and body become visible”; second, there was an acceptance that since learning is a central tenet of education, educational neuroscience could bring a measure of the *biological effects of educational interventions*. The idea of aiming to “simultaneously inform effective practice and build fundamental knowledge about the ways that children and adults learn” is developed from an interdisciplinary perspective, as further described by Fischer, Goswami, and Geake (2010):

For these tools to reach their potential, a stronger infrastructure for educational research needs to be created, including the development of (1) Research Schools, where practice and science jointly shape research; (2) a new generation of “neuroeducators”—**interdisciplinary** researchers and educational engineers with rigorous training in educational neuroscience and the construction of tools that connect research with practice and policy; (3) shared databases on learning and development, including multisite studies that use common measures across domains; and (4) frequent use of research designs influenced by neuroscience and genetics. (Fischer, Goswami, and Geake, 2010, p.68)

As I would rapidly find out, fundamental knowledge extracted from new technologies often carries with it the limitations of those technologies, and even more so the limitations that come with viewing technology itself as a grounding “foundation.” The emergent field of *educational neurosciences* was positioning itself as an attempt to apply empirical methods of neuroscientific research to learning processes; interestingly, the sense of novelty that accompanied the emergence of the field in the early 2000s was based on not-so-new ideas. It was, in fact, an echo of the very first attempt at measuring brain activity, more than a hundred years ago. If today’s brain imaging technologies are often presented as nothing less than a key to accessing fundamental knowledge about how we learn, such enthusiasm can be put in perspective when viewed more as resulting from many slow technological steps leading to current images of the brain in action—from functional brain imaging techniques, such as positron emission tomography (PET images revealed the path of a radioactive tracer in the brain-blood circulation system) and functional magnetic resonance imaging (fMRI images are based on variations in oxygen level in blood at a specific time and location in the brain), to electroencephalography (EEG measures electrical activity at the surface of the brain). All those tools, coupled with a vast array of physiological sensors, became in the late 1990s more readily available outside strict medical applications. The first fMRI was performed on a rodent in 1990 (Ogawa, 1990) and was the result of more than a hundred years of laborious attempts to assess changes in brain-blood circulation to understand the brain’s functional organization.

Since the late 1800s, the consensus has been that an increase in blood circulation in a specific location of the brain is linked with an increase in nerve cell activity at that location. In 1884, an Italian physiologist named Angelo Mosso designed a

human circulation balance, which is today considered the first non-invasive measure of the redistribution of blood during mental activity. In 1884, Mosso's work generated a level of enthusiasm resembling the impact of brain imaging since the 1990s:

The balance [i.e., Mosso's human circulation balance] certainly fired popular imagination, and on 1 December 1908, a French newspaper reported that numerous people "were passionate about the experiments of Professor Angelo Mosso" and enthusiastically believed that this device "would soon fully explain the physiology of the human brain" and lead to new treatments for neurological and mental illnesses. (Sandrone et al., 2014, p.626)

Looking into the historical context of the emergence of today's brain image technologies gave me a sense of perspective: even if today's tool of exploration in Mind, Brain and Education had a feel of novelty, this was nothing new. It was still an attempt at mapping the brain in action. In that context, it seems appropriate to say that educational neurosciences emerged within a *renewed* enthusiasm generated first by technological innovation and only second by critical inquiry. The capacity to better view brain activity in connection with specific tasks, such as reading, speaking, paying attention, memorizing, and so on, is still central to the methodology used to investigate the brain in action.

I wondered at the thought that, just as Mosso's human circulation balance concept had had its limitations, the current *brainscope* might not be providing a much better understanding. I adopted a healthy scepticism. Whatever data brain imaging technology could generate needed to be considered for what it was: data generated by a machine. Such grounding of the field in the latest technologies and data analysis methods felt like a weak spot, some sort of Achilles heel. Humility was required, if not wisdom, in using such tools to research education. What if the new knowledge fell short of meaning, providing only the coordinates on a brain map for some electric phenomena? For example, if fMRI studies have revealed that number processing in the brains of people using Arabic numbers differs from number processing in the brains of those who use symbol system such as Chinese and Japanese (Tang et al., 2006), what exactly have we achieve in educational term? Even if we have the addresses and coordinates on the brain map for Arabic number processing, how can these possibly translate in the classroom, in praxis, in personal interactions? More puzzling was trying to figure out the research questions behind such investigations. In wanting to gain

access to the conceptual foundations in educational neuroscience, I was often confronted with empty boxes.

Educational neuroscience foundations appear to have been fragile from the start, side-road attractions in the context of a much larger phenomenon: the neuroscientific explanatory paradigm, which has swept the humanities—including educational research—a paradigm that came to be known as the *neuro-turn*. In short, the neuroscientific explanatory paradigm reduces human behaviours to neural pathways and in doing so promotes an eliminative ontology where computational accounts of brain function replace psychological understandings of human desires, beliefs, will, and agency.

It was in the hyper-empiricism of the *neuro-turn* that educational neuroscience's attempt at interdisciplinarity would be put to the test: I felt that by struggling to define the parameters of the field, it had turned its back on the difficult fact that scientific knowledge does not have intrinsic "plus value" in complex societal network. Also from the start, this attempt at interdisciplinarity was impacted by the general sense that the neurosciences might have something to tell us about education (education equated here to learning process), but there was no place to address the possibility that the humanities could also have something to tell us about neuroscience. The widespread understanding was that the neuroscientific paradigm would explain it all. This was, to my understanding, unidirectional. In fact, advances in neuroscience seem to present us with new Faustian dilemmas in a time when contemporary science in general has just begun to be more self-aware and less prone to a naïve scientism, as well as more conscious of its epistemological and existential limitations (Tarnas, 1993).

Because the *neuro-turn* is the stage on which educational neuroscience entered the limelight, I think it is important to describe this *turn* in more detail before examining the methods and limitations of educational neuroscience.

1.3. The *neuro-turn* in education

The neuroscientific explanatory paradigm generated a radical change in the framework within which some would investigate human nature. Lavazza and De Caro (2009) identified neuroscience as a “pre-paradigmatic science” because it is at once intellectually stimulating and methodologically confused. The fact that the public has the general impression that all aspects of the human mind can be reduced to understanding the electrochemical functioning of the brain, and that such an understanding is imminent, certainly has contributed creating a boggy context for education.

The term *neuro-turn* I use here points at the massive emergence of neuro-disciplines at the end of the 20th century: *neuroecology*, neurophysiology, *neuropaediatrics*, *neurogeriatrics*, neurochemistry, *neurophysics*, *neurocognition*, neurofeedback, neurophilosophy, neurophenomenology, neuroethics, neuropsychology, neuroculture, neuropsychanalysis, neuromarketing, neuroeconomics, *neurolaw*, *neurosociology*, *neurolinguistics*, neuroeducation, neuropedagogy, *neurodidactics*, *neuromeditation*, *neuroethology*, *neuronutrition*, *neurocooking*, *neuromusic*, *neuroarts*, *Buddha’s Brain*, and so on. This *neuro-turn* in humanities and education has resulted from an omnipresence of neuroscience in fields beyond medicine and can be compared in its impact to the industrial and information revolutions. It marks a pivotal moment in intellectual history wherein neuroscience became viewed as a translational discipline, with methods and theories transferable to other disciplines, both applied and theoretical. I first thought of it as a metaphor transfer gone wrong or as a resurgence of the mechanization of mind that took shape years ago in the Western world. I will consider both standpoints here, since they both carry an explanation for the power and attraction of the neuroscientific explanatory paradigm.

1.3.1. Metaphor transfer gone wrong

I think that the metaphors conveyed by the *neuro-turn* have caught the social imagination in a way that only metaphors can achieve. Metaphors, or parts of thought systems (Lakoff & Johnson, 1980), cannot be controlled by the context from which they emerge, and they often get used in new contexts. The transfer of metaphors between

science and other types of discourse, well illustrated by the Darwinization of our world, reveals the permeability of all types of discourse to biological metaphors. This is particularly striking in the social sciences, where ideas originating from biology often become central to political, economic, and educational theories. This mechanism of “metaphor circulation” has not had solely positive impacts. Continuing with the Darwinian example, the misinterpretation of evolutionary processes (Bowers, 2005)—dramatically introduced by Herbert Spencer through Social Darwinism—has led to, among other things, the elaboration of an individual-centered constructivism (Holmes, 1994); as Egan (2002) argued in his book *Getting it Wrong from the Beginning: Our Progressive Inheritance from Herbert Spencer, John Dewey and Jean Piaget*, some of Spencer’s views are still central in 21st-century educational progressive dogma.

Sabine Maasen has eloquently articulated the crucial role of metaphors in scientific innovation (1995). She has argued that today more than ever, metaphors, by transferring into different discourses, start to assume very different functions:

Have you ever wondered why the term chaos has come to be applied to describe phenomena as diverse as the fractal geometry of coastal lines and the behaviour of stock markets; or why the notion of paradigm shift has been used to depict the Copernican Revolution and an ice cream flavour; . . . Why not acknowledge the examples mentioned as ideas and concepts that are attractive to various discourses at a given time? From this perspective, they become instances of the overall dynamics of knowledge. Somehow, like metaphors in a poem, ideas and concepts appear in different discourses, assuming different functions over a wide range of meanings. (Maasen, 2002, p.3)

One central metaphor in mainstream neuroscience equates the brain to a machine that is somewhat in tune with the world. Neuroscientists do not hold a dualistic view as far as the materialist structure of the mind–brain is concerned, but this metaphor still conveys a fundamentally mechanistic view of the human nervous system coupled with a functionalist theory of mind. Pushed a little further, the metaphor of the brain as a machine also carries the concept of brainhood as a replacement for personhood, whereby people are mostly equated with their brains—a view that could be considered inherited from the cybernetic metaphor of the mind as a computational unit. This metaphor of the brain as a machine was present, from the start, in the emergent field of educational neuroscience. It could be said that educational neuroscience has embraced

ideas and concepts from neuroscience in figures of speech or catch phrases in a way that has profoundly impacted education's objectives and methods. Evidence of this phenomenon of metaphor conflation from one disciplinary matrix to another was puzzling to me: it carried not only the metaphor of the brain as a machine, but with this the qualities associated with simple machines: efficiency, speed, standardized results, and repeatability.

Wasn't the objective of educational neuroscience first to *render educational interventions more effective* behind the more neutral attempt at *building fundamental knowledge about the ways children and adults learn*? In doubt, I made a short detour to gain a broader sense of the influence of functionalism in fuelling the *neuro-turn* in general and its impact in educational neuroscience.

1.3.2. The mechanization of the mind

Functionalism was one of the major theoretical developments of 20th-century analytical philosophy and still provides the conceptual underpinnings of much work in cognitive science (Block, 1996). Even if I were not aware of functionalism's specifics, one look around me would confirm that it connected to a 21st-century obsession with *optimal functioning*. The source of functionalism apparently can be traced to 1960s views of mental states as proposed by Fodor and Putnam, which comprised an empirical computational theory of the mind, a form of machine-state functionalism inspired by the analogies these analytic philosophers saw between the mind and a Turing machine. To be more precise (if that is ever possible using this jargon), in Alan Turing's terms, a mental function was interpreted as a function in the mathematical sense: as an operator transforming inputs (stimuli) into outputs (responses). But within a broader perspective, Wittgenstein's contribution points towards a much earlier influence, back to the Vienna circle's elaboration of logical positivism (1924–1936).

The work of Jean-Pierre Dupuy (2000) in retracing the source of what he described very rightly as *the mechanization of the mind* brought to light the fascinating emergence of the metaphor of the mind as a machine and the deepening of the divide, early in the 20th century, between logical atomism and phenomenology—something that

would have a major impact on the field of cognitive science but that also, by raising the philosophy of *cogito* to its greatest height, would come to define a subjectless philosophy of mind. Subjectless imply here that the attributes of subjectivity are define as emergent effects produced by the self-organized *functioning* of a network.

When I think, remember, desire, believe, decide, and so on, the subject of these predicates is not a ghost in the cerebral machine, a concealed homunculus as it were: it is the machine itself—in the form, for example, of networks of neurons. Cognitive scientists, who defend this thesis or a variant of it, resort to curious expressions: Varela speaks of “selfless minds”, Dennett of “non-selfy selves”, Minsky of a society of mind. But the idea, and its source in cybernetic thinking, is clear enough. (Dupuy, 2000, p.160)

In 1943, McCulloch and Pitts published *A Logical Calculus of the Ideas Immanent in Nervous Activity*, in which they described how neural circuits in the brain demonstrated the possible equivalence, in principle, between neural networks and a Turing machine. This idealization presented an atomistic, digital, and logical view in which individual neurons acted as threshold devices that, when arranged into circuits, could be used to compute logical functions. A few years later, in 1948, *Cybernetics: Or, Control and Communication in the Animal and the Machine* was published by Norbert Wiener (Wiener,1948), a student of Bertrand Russell and one who, throughout his writing, argued for the analogical dimension of mental acts. The metaphysical stance of cybernetics was that the mind was a mechanism, that there was no reason why mental activity could not be explained as a manifestation of the laws of physics, and that if the mind were a machine, it must then be a *logical* machine. Thinking, in short, emerged from a *machine* running algorithms.

Describing the influence of cybernetics on science and humanities from the 50's and the 60's and up until today is an fascinating task that I'll keep for another time and place but I found important to point at who were the scientific at the cutting edge of the field in the early days of the conception of homeostatic machine and other feed-back device able to adapt, up to some extend, to their environment. Ross Ashby, a psychiatrist, became a central figure in post-war cybernetics in UK wrote:

I am something of an artist, not with pencil or paint, for I have no skill there, but with a deep appreciation of the perfect. (...) I have an ambition some day to produce something faultless' (British Library, 2016, Ashby autobiographical notebook – Passing through nature)

In those words I hear and urge and trust in use technology to overcome human limitation. Looking further into Ashby aspiration, Pickering (2010), a British sociologist and philosopher, describes the reception in 1949 of a machine imitating the brain. If it was mostly interpreted as a thinking machine, Pickering insists on the fact that for the early cyberneticists, brain was conceptualized as an acting machine, 'the brain as an immediately embodied organ, intrinsically tied into bodily performances' (Pickering, 2010, p. 6). So behind the mechanistic model often presented, as representative of cybernetics original premise there is a deep holistic counterpoint that is not always made visible looking back from today's standpoint where mechanistic conceptualisation appears to have become the dominant view.

To give the measure of the influence of cybernetics at the time, consider Heidegger's statements in a 1966 interview:

Heidegger: The role of philosophy in the past has been taken over today by the sciences. . . . Philosophy [today] dissolves into individual sciences: psychology, logic, political science.

SPIEGEL: And what now takes the place of philosophy?

Heidegger: Cybernetics.

(Heidegger, 1966, Transcript Der Spiegel Interview)

Cybernetics, from the Greek meaning "steersman," the science of control and communication, was to replace philosophy in this specific era and time. Databases, monitoring, feedback, and observed behaviour would define the metaphysic of that era, with a lasting impact in the form of some sort of sterile takeover of human life by science.

The logic of computational networks would only be challenged in the 1970s, by new studies attempting to formalize autonomous dynamic systems. The researchers included Maturana and Varela, with their concept of autopoiesis (Varela, Maturana, & Uribe, 1974), which literally means "self-creation." This phrase described the nature of

reflexive feedback control in living systems (Alhadeff-Jones, 2008) and expressed a fundamental dialectic between structure and function. The proposed framework issuing from Varela's work is also part of a complexity-oriented epistemology that seeks to understand how order and stability arise from the interactions of several components. Emergence and self-organization in non-linear dynamic systems are fundamental explanatory components of complexity theory.

The computational aspect was then lost in favour of a new focus on the self-behaviour of the network. Or was it really? As I follow Dupuy's description of self-organization within a network, I tend to think that the model of a computational machine is not very far removed. The self-organization of a network comes from the network calculating its state in the next period as a function of its state during the current period. After a transitional period, its collective behaviour stabilizes to a periodic spatiotemporal configuration; when the period is equal to one, the corresponding state is said to be stationary. This stable collective behaviour, with its self-reproducing characteristics, is designated by the term self-behaviour. A network possesses a multiplicity of self-behaviours and converges towards one or another, depending upon the initial conditions of the network.

The "life" of a network can thus be conceived as a trajectory through a landscape of nodes (self-behaviours), passing from one to the other as a result of perturbations from the external world. In applying this model to the brain, for example, the central element is the following: external events come to acquire meaning in the context of the network as a result of the network's own activity. In other words, the meaning that the network attributes to external events is the self-behaviour that results from them, which means that the meaning the brain extracts from external stimuli is purely endogenous and not the reflection of some external objectivity. Although I am in the midst of a detailed description of complex systems theory as applied to brain, I open a parenthesis here to consider the link between the neurological model of the 1970s and what phenomenologists have described long before as "immanent objectivity." Franz Brentano (1838–1917), an influential German philosopher and psychologist, often considered a precursor of the phenomenological movement, wrote in 1874:

The unity of consciousness, as we know with evidence through inner perception, consists in the fact that all mental phenomena which occur within us simultaneously . . . all belong to one unitary reality only if they are inwardly perceived as existing together. They constitute phenomenal parts of a mental phenomenon, the elements of which are neither distinct things nor parts of distinct things but belong to a real unity. (Brentano, 2015, p.163)

In contemporary cognitive neuroscientific wording, we get this computational account:

Our capacities reflect distributed processes throughout the brain. The thousand conscious moments we have in a day reflect one of our networks being up for duty. When it finishes, the next one pops up, and the pipe organ-like device plays its tune. What makes emergent human consciousness so vibrant is that the human pipe organ has a lot of tunes to play. And the more we know, the richer the concert. (Gazzaniga, 2007, p.1)

In computational terms, the self-behaviour of the brain is in itself an entity that both fully participates in the activity of the network and yet, because it results from a higher level of logical complexity, can be said to transcend the activity of the network. In phenomenological terms, following Brentano, the network can also be said to be an intentional creature, an experiencing subject whose reflection becomes valid first-person data (Mingers, 2001). The phenomenological perspective contrasts strikingly with present-day cognitive science's conceptual and methodological perspectives that have never departed from the cybernetics framework; indeed, the idea that cognitive agents process information by virtue of neural computations performed in their brains is a central tenet of contemporary cognitive science. Varela, Thompson, and Rosch (1991) started to point out the limitations implicit in the computational logic of cybernetics: for cognitivists, cognition and intentionality are sufficient as the *modus operandi*, without the need for consciousness, let alone self-consciousness.

What Varela and colleagues initiated by the early 1990s was the view that it might be reductive to consider one's brain as the sole locus of cognitive scientific interest. They started arguing that cognition is not a phenomenon that can be successfully studied while marginalizing the roles of body, world, and action, and the work of Varela—putting forward the concept of cognition as embodied action—became the focus of much attention. In very recent years, a new generation of cognitive theorists

and neuroscientists has been increasingly receptive to a phenomenological approach to the experimental dimension of reality.

Attempts at integrating neuroscience and phenomenology suddenly offer the possibility of merging methods from empirical neuroscience, and from Merleau-Ponty's views of the genuine activity found in nature and the circular causality of the relation between an organism and its milieu: "In reflection, we find ourselves in a circle: we are in a world that seems to be there before reflection begins, but that world is not separated from us (Varela, Thompson, & Rosch, 1991, p.3).

When I first read Varela's work, I remember wondering whether, just as nature frequently features logarithmic spirals, the brain, being made of the same basic substances as a sunflower or a seashell, can only come up with abstract tools that reflect its own making. If this were the case, which I think it is, what type of inquiry would serve, I wondered, this level of understanding and illuminate the subject from a new angle, bringing together vocabularies, methods, and epistemologies? Thompson has further enriched this truly transdisciplinary work, blending philosophical inquiry about our sense of self with cognitive science and neuroscience, weaving until disciplinary boundaries disappear. In his book *Waking, Dreaming, Being: Self and Consciousness in Neuroscience, Meditation, and Philosophy* (2014), Thompson proclaimed a new territory wherein first-person experience is the essence of human *self*-elaboration, rather than third-person representations of brain activity or a third-person transcendent spiritual realm. Here, I felt, narrative was emerging from a new standpoint:

the nervous system is self-specifying—how it enacts a unique sensorimotor perspective that functions as the subject of perception and the agent of action—and how dynamic neuroelectrical fields may be the crucial substrate for consciousness. Together, these biological processes are enough to bring about a unique embodied perspective on the world, in which you feel your body from within as it defines the center of the surrounding space in which you perceive and act. Yet having this kind of basic experiential perspective is not enough to give you the feeling of being a self who is a thinker of thoughts and a doer of deeds. To have such sense of self, you also must be able to attend to your experiences and conceive of yourself as a subject of experience. . . . being a "self-designating" system. (Thompson, 2014 p. 344)

This integrative approach in philosophical inquiry for tracing the road to our sense of self and the neural correlate of consciousness is foundational in the elaboration of a new ontology but also needs to be elaborated with care. Considering that the concept of “self-designated system” is also central to work done in the field of artificial intelligence, more specifically in what is designated by Strong AI, it needs considerable elaboration to avoid coming full circle back to computational philosophy of mind.

The *neuro-turn* or neuroscientific turn has often been described as a demonstration of how neuroscience was becoming a translational discipline in its drive to integrate new knowledge about the brain into the humanities, society, and technologies (Illes, 2012). If transdisciplinary approaches were starting to emerge from the pioneering work of Varela, these nonetheless did not impact the way the *neuro-turn* was going to make its mark upon quantitative research in education. The mechanization of mind that prevailed in the Western world, with its implied cybernetic “philosophy,” would be present from the start in the emergent field of educational neuroscience. It was not going to be a shared methodology but instead the imposition of neuroscientific premises onto research on cognition and human behaviour more generally. Even more powerful than a metaphor gone wrong or the process of mechanizing the mind, the uncritical acceptance of scientific knowledge as bearing objective true value outside the realm of societal networks was going to make transdisciplinarity almost impossible from the start. Neuroscience seemed to exert its towering influence upon other disciplines in a top-down rather than lateral manner.

As I will describe in the next section, the main focus in neuroeducational research is the need to access, in real time, the data emerging from the nervous system to gain an understanding of human cognitive function, including memory, attention, speech, emotion, and consciousness. In other words, the central methodology in educational neuroscience is technological rather than critical, which presents inherent challenges and limitations.

1.4. Methods and myths in educational neuroscience

In educational neuroscience, the use of brain imaging as its central methodological approach carries the intrinsic risk of this and other technologies distracting attention, through complex statistical data analysis, from the conceptual validity of the research itself. It is certainly euphemistic to say that it is far from simple to determine the neural markers establishing the connection between the recorded physiological variables and the mental phenomena of interest. It is one thing to find neural correlation but quite another to establish causation, something data-based research has to face just as hypothesis-driven research does.

It was inescapable that somehow, experiments to determine the neurological processes involved in human cognition would be driven by a need to optimize learning. While educational neuroscience—the application in education of neuroscientific findings—seems, in itself, a fascinating field once limited to cognitive science, it has also brought to light many challenges in both the research and the applications of such research.

If some educational practitioners and administrators have embraced brain-based programs as an educational panacea, they have been forced to realize that metaphors such as “multiple intelligences” or “learning styles” (among many others) not only extrapolate far beyond the data but also lack substantive content, misrepresent neuroscientific concepts (Beltz, 2000), and are symptomatic of faulty frameworks, partial perspectives, and the absence of a shared language. For example, Howard Gardner’s description of what he called “multiple intelligences” was only meant to avoid the credo of operationalization and test-making in education and to promote the individualization of instruction (Christoff, 2008). It was never intended as an oversimplified categorizing tool.

Interdisciplinary research that combines neuroscience and education have been missing a mutually comprehensible language. Bruer (1997) did express early on that education and neuroscience were “a bridge too far,” identifying cognitive science as better suited to solving educational problems. His concern did not prevent what was going to follow. Education has witnessed a series of neuromyths (Geake, 2008) that invaded educational practices at an incredible speed, ranging from left- and right-brain

thinking, to multiple intelligences, to visual, auditory, and kinesthetic learning styles, to other concepts. Even if the astonishing endorsement of neuromyths by many educational practitioners can be explained by the communicative limitations of some neuroscientists, or by the still prevalent use amongst teachers of the computer analogy to describe human cognition (Byrnes, 2001), such explanations nonetheless do not fully account for the uncritical acceptance of neuromyths in education.

Looking more closely into one of those neuromyths—the theory of left- and right-brained thinking that led to the promotion in classrooms of “right-brain creative thinking”—we are faced with an example of over-simplification of data produced by neurological studies of split-brain patients. Before brain-imaging technologies, neuroscience relied on brain-injured people to investigate brain functions. The studies on split-brain patients, who were missing the corpus callosum (the communication path between the two brain hemispheres), concluded that separated hemispheres could separately process different types of information, with only the left hemisphere permitting verbal reporting. From there, a myth took shape, implying that language was exclusive to the left hemisphere and creative problem-solving exclusive to the right. What was forgotten? Simply that the studies were made on split-brain patients. Considering that it is impossible to find even one neuroscientist who would suggest that brain function and behaviour are based on localization and not on interaction, how did the left–right brain myth become so popular amongst teachers?

Many attempts to explain the persuasive force of neuroscience and its epistemic authority point at people’s expectations of finding well-established models of reductionist explanations (Meloni, 2011). The particularly persuasive force of brain images was demonstrated by McCabe and Castel (2008) in their study of the effect of brain images on judgments of scientific reasoning. Having asked participants to rate the quality of articles on cognitive neuroscience wherein data were accompanied by brain images, by other representations of data, or by no representations at all, the study revealed that the data accompanied by brain images were judged to be the most reliable, a tendency that may be related to people’s natural affinity for reductionist explanations of cognitive phenomena and for the illusion of explanatory depth. These images simply struck the imagination and brought about simplistic beliefs about causal relations, based on

correlates between brain activity and behaviour. Critics of methodology in educational neuroscience first focused on the dubious claims made from naïve uses of brain images, an issue also called *localism*, which has little purpose in education: knowing the location of a cognitive function for the sake of mapping the brain is of no use whatsoever for improving educational practices.

The central tool of research in neuroscience, functional neuroimaging, has given researchers some access to the brain in action, yet the resulting colourful images do not come with detailed explanations of how they are generated and how they can be interpreted. For example, images obtained by EEG (electroencephalography)—which measures electrical fields near the scalp, generated by neural processing—provide data with very low inertia, and the delay between a change in brain activity and the recording of this change is in the order of milliseconds. It is a method well tuned to the speed of elementary cognitive acts (Fingelkurts & Fingelkurts, 2006) and has the advantage of being non-invasive. Still, exhaustive statistical analysis is required to extract meaning from EEG data. Since the signal-to-noise ratio in brain imaging is generally poor, the statistical validation of results becomes decisive. As pointed out by Doesburg, Roggeveen, Kitajo, and Ward (2008), phase synchronization between two neural sources indicates that information is in all likelihood being exchanged between those sources, but often this phase synchronization is not sufficient to infer causality. New statistical tools are being developed to overcome these data analysis limitations (Bressler & Menon, 2010).

Images obtained by fMRI (functional magnetic resonance imaging) require that the participant be placed in a strong magnetic field where signals of the changes in local haemodynamics (brain demand for oxygen) that result from modification of neural activity are mapped. fMRI is based on the fact that haemoglobin has different magnetic properties depending on whether it is oxygenated or not (Ashby, 2011). If the central assumption or guiding inference is the linear model, which states that the fMRI signal is appreciably proportional to a measure of local neural activity averaged over a period of time of several seconds, then fMRI is not without its own methodological problems (Heeger & Ress, 2002); often, for example, it is faulted for generating colour pictures of the brain that give the illusion of explanatory depth.

It cannot be stressed enough: neuroimaging data are essentially statistical. The more densely coloured zones in fMRI images represent areas of statistically significant different levels of neural activation compared with the activation level caused by a comparable task or a baseline. It is important to understand that it is up to the experimenter to define the baseline, which implies that changes in statistical parameters will alter the extent, number, and distribution of the highlighted zones.

With this understanding, it becomes obvious that images obtained by neuroimaging technologies do not carry information in themselves but instead need to be analyzed and interpreted in a very specific methodological context. The design of neuroimaging experiments involves numerous decisions regarding the choice of suitable control stimuli to contrast with the main stimuli, since at any given time in a cognitive task, most of the brain is involved. Even if experiments can potentially identify neural correlates of a particular cognitive behaviour, this does not imply that the neural activation in a specific and statistically determined zone of the brain completely determined the supposed cognitive demands of the task done by the subject of the experiment.

Hence, there is no such thing as simple mapping between brain function and cognitive behaviour (Geake, 2008). As the capacity for spatial and temporal resolution of structural, functional, and electrophysiological imaging technologies improves, it is expected that there will be better resolution in measuring brain activity. It is also expected that with the increasing efficiency of computing technology, it will become possible to provide calculations related to cognitive activity in near-real time. The next step, to actual neuroimaging technology, is a more fundamental interface currently under scrutiny, which constitutes the first attempt to bridge biological systems with physical systems. In nature, within biological systems, electrical signalling occurs via ions and protons rather than electrons. Already, the first biocompatible device that can control and monitor the flow of protons in a biological system has been put into operation (Zhong et al., 2011).

Methodology is the most important concern in educational neuroscience. As some critics have asserted, neuroscientific methods demanding highly artificial contexts

(e.g., fMRI, wherein the subjects must be immobile) cannot provide useful data about classroom contexts. For my part, I have not come across any evidential claims in educational neuroscience that did not overstep the minimal use of extreme caution in making claims. The pioneering work of Dunbar, Fugelsang, and Stein (2007) on conceptual changes provides a useful illustration of the epistemological and ethical challenges. Their work and research claims are not in question here, and they made no educational claims. Difficulties, however, arose when their results left the four walls of their lab. First, what did Dunbar, Fugelsang, and Stein (2007) proposed in their article titled *Do Naïve Theories Ever Go Away? Using Brain and Behavior to Understand Changes in Concepts?* Using fMRI, they were interested in brain activation patterns, specifically variations between physics students and non-physics students when the subjects were shown two different movies of two falling balls, one being consistent with Newtonian mechanics (balls of different masses fall at the same rate) and the other one showing the bigger ball falling at a faster rate than the smaller ball.

The fMRI data indicates that physics students had made the conceptual leap from a naïve “Impetus” view of physics to a “Newtonian” theory. First, when the physics students saw the “Impetus” movies (with the bigger balls falling faster than the smaller balls), the anterior cingulate showed increased activation relative to the baseline. Thus, the physics students appeared to be regarding the “Impetus” movie as erroneous, whereas the non-physics students saw the “Newtonian” movie as erroneous. Conversely, when the non-physics students saw the two balls falling at the same rate regardless of size, the anterior cingulate showed increased activation, indicating that they regarded these movies as strange or erroneous thus resulting in response conflict. (Dunbar, Fugelsang, & Stein, 2007, p.201)

Those results were consistent with their previous work on complex causal thinking in what would become a seminal publication titled *Brain-Based mechanisms underlying complex causal thinking*:

The fMRI data may also provide a neural instantiation for the growing body of research on confirmation bias that has been examined over the past several decades. For example, researches in cognitive psychology, scientific thinking, judicial reasoning, medical reasoning and politics have all noted the preponderance of confirmatory-based reasoning strategies across many disparate domains. Providing a neural mechanism by which these biases operate may assist in the development of techniques to minimize such biases when they may hinder effective reasoning. (Fugelsang & Dumbard, 2005, p.1210)

Although interesting in itself, this study did not pretend to have found direct implications for educational practices, except to confirm what most teachers know: individual preconceptions about a topic have to be brought to light before any conceptual changes can happen.

Where such matters became troublesome was in subsequent work, putatively based on Dunbar, Fugelsang, and Stein's, by others in educational neuroscience arguing for direct application in the classroom. Masson, Potvin, Riopel and Brault-Foisy (2014), in "Differences in Brain Activation between Novices and Experts in Science During a Task Involving a Common Misconception," have been very vocal within teachers' professional development conferences. Their claim runs as follows. Inhibition mechanisms are involved in the case of the expert physics students, so that even if their preconceptions exist, "they have simply learned to inhibit them." They then proceed from the lab to the classroom in one giant step, by claiming that educators should teach students how to inhibit their anterior cingulate cortex. The idea goes a step even further by stating that this would work particularly well for teaching scientific concepts:

Building on these guiding principles, Potvin formulates three operational propositions for achieving conceptual change in science. According to the author, "overtaking" the students' initial conception by making the scientific conceptions prevail at the end of the teaching sequence would be the appropriate pedagogical objective to pursue. To do so, he argues that it is necessary to (1) make the desired conception available at the very beginning of a teaching sequence so that the learners have another strategy or answer to choose, (2) introduce inhibitive warnings to make learners aware that their misconceptions are insufficient in certain contexts and that they might be tempted to fall into a trap, (3) make the prevalence of the desired conception last by repeatedly exercising the learners' reflexes to inhibit a tempting-but-incorrect answer and by reinforcing and automatizing the desired scientific conception. According to Potvin, science teaching must be taught "in terms of strategies that aim at durably increasing the status of the particular inclinations that lead to scientifically correct performances." (Brault, Potvin, Riopel & Masson 2015, p.34)

The diffusion of such unsustainable extrapolations from the initial work of Dunbar, Fugelsang, and Stein into classrooms has often gone viral in the media under claims of "reading students' thoughts," "monitoring students as they learn to better inhibit," "wanting to diagnose kids as they enter school," and so on. As this example clearly

shows, educational neuroscience can pathetically fall victim to oversimplifications. It is far from simple to determine the neural markers establishing the connection between recorded physiological variables and mental phenomena of interest. Finding neural correlation is one thing, but establishing causation is quite another.

Something to keep in mind when reflecting on the relevance of educational neuroscience methodology is that it relies entirely on brain imaging technology using statistical methods to monitor the *brain in action*. fMRI is now 25 years old. It has recently been revealed that the statistical tools most commonly used in over 40,000 fMRI studies have never been validated with real data. The publication in 2016 of *Cluster Failure: Why fMRI Inferences for Spatial Extent Have Inflated False-Positive Rates*, by Eklund, Nichols, and Knutsson, had the effect of a cold shower: the expected 5% false-positive rate turned out to be as high as 70% in some studies. It is too early to discuss the impact this study will have on the field, but the seeds of doubt have been sown. It turns out that questions relevant to neuroscience might not be relevant at all to education, so it is presently difficult for educational neuroscience to make claims of interdisciplinarity.

At the time I was discovering the preceding studies and complications, the only way I could see value in bridging education and neuroscience was if the emergent field could demonstrate its capacity for transdisciplinary work, its ability to reach between, across, and beyond disciplines to achieve a better understanding of our oneness with the world and to steer away from dualism of all kinds. From the example above it is obvious that I did not find what I was looking for; indeed, I have come to argue that in its current state, the incursion of neuroscience into educational research is detrimental for education because it equates education with learning, and because it imposes inadequate methods upon the exploration of human interactions that constitute the essence of the living process that is education. How would truly transdisciplinary approaches at integrating knowledges achieve better results in educational research? By leaving behind dualistic ontologies and hierarchies in knowledge-acquisition pathways, and by fully embracing first-person experience. Such an approach would invite careful examination of the self in interaction with others.

1.5. Transdisciplinarity as a tool for a new ontology

A short definition of transdisciplinarity and a sense of its historical context are important here to bring into focus what I was looking for in the field of educational neuroscience. Since it was an emergent field of inquiry, I was expecting it to provide a method and framework that would go beyond disciplinary boundaries. This difficulty for people-researchers to meet outside the boundaries of their respective disciplines derives from the very nature of the “discipline” concept. For Kuhn (1974), what makes communication possible amongst a group of practitioners in a specific field is a shared disciplinary matrix, which can itself restrict the integration of unfamiliar elements into a disciplinary language that could lead to the discovery of new aspects of a phenomenon. This matrix, made of analogy, models, or systems of thought, is highly specific to a domain and at the heart of the “essential tension” between the will of researchers to maintain their shared commitment to a disciplinary matrix and their desire for innovation. This could be what makes transdisciplinarity so hard to achieve: this tipping point where historically, there has been a conservative tendency to maintain the guiding theories of a disciplinary matrix until anomalies lead to what Kuhn called a confidence crisis.

Transdisciplinarity is a relatively new concept, first discussed by Piaget in 1972 in connection with education—mostly with respect to hierarchy in epistemological relationships—and also by Jantsch, whose definition was influential in distinguishing transdisciplinarity from cross-disciplinary education, research, and practice by the way it insisted on the relational aspect of educational interaction (Augsburg, 2014). Piaget proposed:

a higher stage succeeding interdisciplinary relationships . . . which would not only cover interactions or reciprocities between specialised research projects, but would place these relationships within a total system without any firm boundaries between disciplines. (Piaget, 1972, p.138)

This might very well be an open question for research communities in any and every discipline: Who is willing to leave the perceived safety of a disciplinary “home” to explore beyond “any firm boundaries between disciplines”? For me, it appears to be as if steps made in self-exploration with an embodied sense of being-in-the-world make it impossible to sustain boundaries.

1.5.1. A definition of transdisciplinarity

Two main schools of thought on transdisciplinarity emerged at the turn of the century: one associated with the theoretical physicist Basarab Nicolescu and the other with the philosopher Edgar Morin, both of whom argued for a methodology that would strive for unity of knowledge based on different epistemological and ontological grounds than the ones provided by disciplines. In that respect, transdisciplinarity stands completely apart from multidisciplinary and interdisciplinary inquiries. Nicolescu defined the three pillars of transdisciplinarity as follows: “(a) knowledge as complexity (epistemology); (b) multiple levels of reality mediated by the Hidden Third (ontology); (c) the Logic of the Included Middle, which is in contrast to the binary, exclusive logic of disciplinary knowledge” (2008, p.107). Nicolescu is a theoretical physicist, and his exploration of transdisciplinarity was sparked by the importance he found in moving from classical physics, describing a macro-physical reality, to quantum physics and cosmology, with their multiple reality levels and non-reductionist and non-dualistic standpoints, wherein opposites may be different from each other but they cannot be separated from each other. He saw this difficulty of moving from one reality to the other as creating “an unconscious barrier to a true dialogue” about transdisciplinary methodology. What Nicolescu describe as the Hidden Third is this place where one is invited to shed resistance to other realities and join them in generating complex, transdisciplinary knowledge.

For the French philosopher and sociologist Edgar Morin, there is an urgency to attempt nothing less than a reform of thinking and his contribution seem to define transdisciplinarity: “Un savoir n’est pertinent que s’il est capable de se situer dans un contexte et que la connaissance la plus sophistiquée, si elle est totalement isolée, cesse d’être pertinente” (Morin, 1998, p. 3). Further, “There is a more and more wide, profound and serious inadequacy between our disjointed, piecemeal, compartmentalized knowledge, on the one hand, and ever more polydisciplinary, transversal, multidimensional, transnational, global, planetary problems” (Morin, 1992, p.381).

So clearly, multidisciplinary and interdisciplinary don’t carry such fundamental changes in how we think and how we define knowledge. Multidisciplinary approaches imply studying a research topic via several disciplines at the same time, which will

necessarily enrich the view of the topic but in the context of serving one home discipline. The framework of disciplinary research remains unchanged. Interdisciplinarity, for its part, involves the transfer of methods from one discipline to another and thereby contains the capacity to generate new disciplines, but often it occurs within the scope of only one of the disciplines involved in the interdisciplinary venture. This is, I think, where educational neuroscience found itself: it was a venture hoping to define itself as interdisciplinary but to use methods provided only by the neurosciences.

Transdisciplinarity in any research topic cannot be achieved until a foundational framework has been established, elaborated upon, and shared. I really struggled to make sense of how the whole scientific enterprise could sit at the table of transdisciplinarity without, so to speak, turning the water murky. Paradoxically, I could not step out of my disciplinary training! That is, not until I started reading and explored Bruno Latour repositioning of the scientific endeavour as what it truly is: the product of a complex network of societal interactions. For Latour (2009), the boundaries erected between knowledge and beliefs by our presumed modernity are responsible for the rupture between science and society:

just like in La Fontaine's fable of the artist who, after sculpting a chef-d'oeuvre, steps back to look at it and is suddenly filled with fear. His work was so convincing that he, for a moment, felt it to be real. This fable describes the essential character of image making: the maker gives the object an autonomy it does not have in the first place, but through this process, the object is literally out of his hands and takes on a life of its own, transforming the maker in the process. (Latour, 2009, p.15)

Could this fable also illustrate what seems to have happened in the case of neuro-educational research? With neuroscientists too often, in my view, operating via a disconnected sense of entitlement and absoluteness, it was obvious that any attempt at interacting within the sphere of education was going to be disastrous. If we agree that scientific endeavour is the product of a complex network of societal interactions then there is no such thing as neuroscience outside the complex networks of people, technologies, and societies: it's tools might be called the *scientific method*, but those applying it are mere humans. Latour goes as far as stating that this is where the postulate of modernity has failed: we thought that it was possible to establish knowledge independently from any societal or political connection, but it never happened. In *We*

have never been Modern, Latour (1993) argues that ‘networks are simultaneously real, like nature, narrated, like discourse, and collective, like society’ and that our knowledge is a double construction ‘science with society and society with science’ (p.6). In that respect, neuroscientists would greatly gain, I would argue, in becoming transdisciplinary before venturing outside the lab and within the *network*.

In *Reassembling the Social - An Introduction to Actor-Network-Theory*, Latour (2005) proposed exploring the relational ties within a network and its actors, which made room for an analysis of human and non-human interaction that can be applied to innovation and technological development:

It should be the simplest thing in the world. We are all bound by social interactions: we all live in a society: and we are all cultural animals. Why do these ties remain so elusive? (...) The adjective ‘social’ designates two entirely different phenomena: it’s at once a *substance*, a kind of stuff, and also a *movement* between non-social elements. (Latour, 2005, p.361)

An innovative sociologist is presenting a framework that situates scientific inquiry within social interaction and not as a fictive third-person observer? It felt as a fantastic idea, and I’ll get back to it in Chapter 5. In short, reconceptualising science as a social construct influenced by numerous agents within a network could explain directions taken by neurosciences, directions that seem to be driven by economic interest. How far does the legitimacy of the neurosciences extend? If I simply look at brain images of learners in the context of neuroeducational research, they seem to be anything but evidence of neutral technological success; indeed, they raise difficult issues of unsupported normative evaluations of learners, false diagnostics, and commercial remuneration. Reading Latour prompted me to consider the possibility that from an actor-network perspective, transdisciplinarity would have better opportunities to emerge in research.

1.5.2. A profile for transdisciplinary

After my disappointment at measuring the limitations of interdisciplinarity within educational neuroscience, I started wondering whether the current elaboration of transdisciplinary thought was in fact too theoretical to be applied at all—and, if not, then who were the transdisciplinary? Was there any characteristic that could describe

someone able to go from discipline-based knowledge to a transdisciplinary attempt at creating knowledge?

I came across Tanya Augsberg's (2014) literature review of research done since the 1970s on transdisciplinary skills and traits with great interest. I found out that already in 1994, De Freitas and colleagues had identified the characteristics of individuals more likely to develop a transdisciplinary attitude, the three most important, in my view, being: (i) the ability to recognize the existence of different levels of reality governed by different types of logic, (ii) openness to and acceptance of the unknown, and (iii) tolerance of ideas opposed to one's own. More work has also pointed to the capacity to engage in meaningful dialogue while suspending one's point of view (Giri, 2002), and to have a "modest positionality," which involves the understanding that there is not a perfect or absolute solution to any issue.

Transdisciplinarity is a field of relationship, and research on transdisciplinary attitudes has recognized the need to acknowledge the challenge of cultivating dialogue and authenticity where "alpha experts" have roamed freely for a very long time.

To join two unlike things, as in the poetic process of metaphor or analogy, is to provide a special kind of insight—what rhetorician Kenneth Burke famously called "perspective by incongruity". One of the most remarkable values of transdisciplinary work, we believe, is this perceived incongruity—bringing together vocabularies, methods, and epistemologies that might at first glance appear mutually exclusive—to illuminate a subject from new angles. (Littlefield & Johnson, 2012, p. 3).

What are these mutually exclusive epistemologies? In the view of neuroscience, learning is often synonymous with memory. The general acceptance is that we have multiple memory systems and that learning, in terms of memory formation, occurs by changes in patterns of connectivity between neurons—synaptic plasticity. Bennett and Hacker (2005) defended an anti-reductionist framework for neuroscience, pointing at what they call mereological confusions in cognitive neuroscience. As a formal theory of parthood relations (the logic of part/whole relations), mereology made its way into modern philosophy mainly through the works of Brentano and of his pupil Husserl (*Logical Investigations*, 1901). First, Bennett and Hacker put forward the affirmation that ascribing psychological attributes to the brain is a mereological fallacy in neuroscience. By

ascribing mental states to brains, neuroscientists use predicates in reference to a part, although only the whole (the human being) can be the proper subject matter. The brain does not perceive; it does not remember or think. According to the authors, such statements fail to meet the criteria of conceptual probity. These claims are not false; rather, they are devoid of sense (Kohler, 2003).

Slogans such as “teaching for the brain” certainly do nothing to improve the general understanding of cognitive functions and might even misrepresent the recent research in cognitive neuroscience, where since the 1990s, phenomenology has accompanied the development of the conception of the embodied mind and embodied cognition, or in general terms, dynamic perspectives on cognition (Di Paolo, 2001). I earlier commented on the risk of oversimplification that often accompanies the use of metaphor; Thompson (2007) goes further in affirming that in the case of the metaphor of information in computationalism (the mind as a machine) as well as in genocentrism (DNA as an information store), not only is it an oversimplification, but it also prevents a genuine understanding of the complex dynamics of autopoiesis, considered the fundamental and paradigmatic case of biological autonomy. Under the influence of Cartesian dualism, cognition and the mind have long been split from action and the body, and the major challenge facing neuroscience today (Thompson, Lutz, & Cosmelli, 2005) is to provide an explanatory framework that accounts for both the subjectivity and the neurobiology of consciousness and cognition.

If traditional neuroscience has tried to map the brain’s organization according to a hierarchical input–output processing model, assuming a division between independently existing external objects and their internal representations in symbolic media in the brain, the enactive viewpoint looks at brain processes as recursive, re-entrant, and self-activating—but mainly, *they do not start or stop anywhere*, something that constitutes a shift from Descartes’ “thinking thing” to a more Heideggerian approach (Heidegger, 1962) of being-in-the-world. In a much broader way, the relevance of Merleau-Ponty’s phenomenology of embodiment is supported by the fact that he fully resists dualities such as perceptual/motor or object/subject, but instead reveals their inherent mutuality. For Varela (Varela & Shear, 1999), this misleading divide cannot be maintained, and the apparent scientific objectivity cannot be characterized as dealing

with things-out-there as if they were independent of mental contents-in-there. Thompson's (2004) statement that "[m]ind is life-like, and life is mind-like" led to his more thought-provoking formulation: "Living is cognition." That could constitute a good start for a transdisciplinary profile.

1.6. Something left behind in the *neuro-turn*

If I have not found an example of transdisciplinary achievement in the field of educational research done at the intersections of neuroscience, cognitive science, and cognitive psychology, I have nonetheless not emerged empty-handed. I have confirmed my initial view that neuroscience and education are "a bridge too far," in so far as mapping and describing neural networks and patterns does not present the kind of theoretical integration capable of yielding new knowledge for education, as transdisciplinarity could. I argue for a definition of education that cannot be equated with learning and wherein no causal link is conceded between education and biology. Concerns about the seductiveness of neurobiological explanations seem to be taking shape in the literature on philosophy of education (Biesta, 2011b; Hewitt & Kincheloe 2011). The historical perspective offered by Meloni (2011) is interesting for its openness to exposing the profound difficulties in any attempt to merge different vocabularies and intellectual traditions.

The history of the humanities and social/cultural disciplines was largely structured around a rejection of the relevance of any naturalistic explanations for the notion of being human. This rejection, starting with Hegel's dismissal of phrenology in his *Phenomenology of the Spirit*, continue to this day, for instance in Paul Ricoeur's accusing brain science, in his dialogue with neuroscientist Jean-Pierre Changeux, of presupposing a construction of the mental that proceeds by dismantling . . . the human experience. (Meloni, 2011, p.307)

These conflicts are eminently present in philosophy of education, underlying the polarized position of education as an art and/or an applied science. In Biesta's (2009a) question on the role of education—"Building bridges or building people?"—I recognize a successful attempt to bring attention to the fact that empirical research in education might not be able to take into account the particular nature of educational processes and

practices. First, it does not acknowledge that education is intrinsically open-ended, which makes it an ongoing experiment in itself. Second, education is not easily confined to measures of what works or does not. Even more important, I would add that the supporting theoretical framework in empirical research is not always explicitly described and exposed. Could philosophers of education play a role by asking important questions of how existence (ontology), knowledge claims (epistemology), and selfhood (metaphysics) can be considered within neuroscience? I think so. I will never forget Biesta's patience, when I crossed paths with him at the 2012 AERA Annual Meeting, in sharing with me his view on the irreconcilable nature of neuroscience and education, one that he had published the previous year:

The one notion that does not capture at all a sense of interiority is that of the brain. Yet it is the brain, and particularly the way in which the brain functions as being mapped out by contemporary neuroscience, that is emerging as a new holy grail for education. One reason for caution is that much neuroscientific research operates from the outside in, so to say. It starts with social phenomena, that is, with phenomena that exist in the social or intersubjective world and that for their reality depend on being named and identified by human beings in a particular language, and then looks for its neurological correlate in the workings of the brain. This already raises questions about how "hard" the evidence from neuroscience actually is, if the phenomena it is interested in are basically social phenomena. But the much more important point is that the language of the brain does not capture the very things that matter educationally in the way outlined above, as these "things"—which are not things in the material sense of the word—are events on an existential plane. (Biesta, 2012, p.598)

Although I profoundly agreed with the conceptual and methodological impossibility of reducing education to the narrow scope of investigation in neuroscience, I had to explore further just how far this neuroscientific take-over could go. I was worry and concerned, but still, I walked to the edge of the mechanistic worldview, then I walked amongst transhumanists.

My narrative throughout this chapter is one that sustains an intellectual journey. It also exposes a tormented quest. There is this urgency to make sense of the impact of the paradigm shift in our society brought about by the *neuro-turn*—a fear of losing the richness in what it means to be human. But there is more to this urgency, and it is for me to find my way to the unique richness of my own life. Ideas form a powerful refuge, and I

grew up thinking that they alone could protect me from emotional pain. What started as an intellectual journey evolved into a profoundly transformative journey.

Summary

After being attracted to quantitative research that attempted to bridge educational practices and neuroscience, I came to realize that those initiatives were imbedded in a larger mechanistic view of the mind. Finding neural correlations with mental phenomena is one thing, but establishing causation is quite another. Educational neuroscience did not emerge as the transdisciplinary venture it claims originally to be; instead, it seems simply to be an expression of the neuro-turn in education. I argue that conceptual and methodological impossibilities prevent the reduction of education to the narrow scope of investigation in neuroscience. I also discuss the idea that repositioning scientific inquiry with the tools of a radical sociology is worth considering as an entry to transdisciplinarity.

1.7. Postscript

The poem *Visitor* offers me a profound recognition and celebration of the other and of how we, in fact, only exist in resonance with one other. “I was hoping to sit with you in a tree house in a nightgown in a real way. Did you receive my invitation?” So much in these words speaks to me of my intersubjectivity. The powerful rhythm and musicality of the last line take me by the hand and lead me down the path to the other or to the absence of the other. I read it here out loud: “Like a dark book in a long life with a vague hope in a wood house with an open door.” Open doors—to the other, to life lived in full within the infinite realm, to our shared humanity.

Poem 1. **Visitor – B. Shaughnessy (2012)**

I am dreaming of a house just like this one
but larger and opener to the trees, nighter
than day and higher than noon, and you,
visiting, knocking to get in, hoping for icy
milk or hot tea or whatever it is you like.
For each night is a long drink in a short glass.
A drink of blacksound water, such a rush
and fall of lonesome no form can contain it.
And if it isn't night yet, though I seem to
recall that it is, then it is not for everyone.
Did you receive my invitation? It is not
for everyone. Please come to my house
lit by leaf light. It's like a book with bright
pages filled with flocks and glens and groves
and overlooked by Pan, that seductive satyr
in whom the fish is also cooked. A book that
took too long to read but minutes to unread –
that is – to forget. Strange are the pages
thus. Nothing but the hope of company.
I made too much pie in expectation. I was
hoping to sit with you in a tree house in a
nightgown in a real way. Did you receive
my invitation? Written in haste, before
leaf blinked out, before the idea fully formed.
An idea like a storm cloud that does not spill
or arrive but moves silently in a direction.
Like a dark book in a long life with a vague
hope in a wood house with an open door.

Chapter 2.

Walking among Transhumanists

Overview: In this chapter I will be walking among transhumanists who are gravitating toward the outer edge of the neuroscience of learning, in the stratosphere of artificial intelligence (AI), the ultimate frontier for the metaphor of humans as machines. This walk will reveal profound fear: of death, of fragility, of love. Fear is a powerful driver for research in neurotechnology, where the prospect of becoming smarter overshadows the wish to become wiser. Here, I will examine the need for an *in-turn*, leading to a better look at our intersubjectivity and ontological being-in-the-world.

2.1. On transhumanism

La quête de la vie sans fin, de Gilgamesh à nous:
La lutte contre la veillesse et la mort font évidemment partie du projet
transhumaniste. Il s'agit bien de faire passer le désir d'immortalité de la
mythologie et de la religion vers la science.
(Ferry, 2016, p. 67)

For a time, I was drawn to researchers working on AI who were endorsing transhumanist views, drawn in the same way that people with vertigo can be attracted to the edge of a cliff. I found such research very puzzling, since transhumanism operates on a default assumption with which I disagree: that whatever comes to define human life is not *enough* and that we should put technological, scientific, and economic effort into moving past human capabilities in all aspects of life—health, longevity, intellectual capacity, memory, and so on. I think I was fascinated by the fact that although I am immersed in recognizing the need for an *in-turn*, where intersubjectivity and ontological being-in-the-world could flourish, the world I live in seems to have a much different agenda: technology, technology, and more technology. I figured that if I knew more

about transhumanism, I could engage in a fruitful conversation with educators instead of trying to overlook, for example, the impact of the *neuro-turn* in education. I could better understand that the inclusion of coding (i.e., computer programming, machine language) in primary school had more to do with mild transhumanist views than with the most superficial narrative about preparing students for 21st-century-specific skills defined by national agencies.

The term *transhuman* refers to a transitional being, transiting between a moderately enhanced human to a fully post-human being or thing...I'm not too sure here if it would be called a thing or a living being. Proponents describe transhumanism as:

an interdisciplinary approach to understanding and evaluating opportunities for enhancing the human condition and the human organism opened up by the advancement of technology. Attention is given to both present technologies, like genetic engineering and information technology, and anticipated future ones, such as molecular nanotechnology and artificial intelligence. (Bostrom, 2005, p.87)

Nick Bostrom is a Swedish philosopher at Oxford University and a leading figure in contemporary transhumanist thought. He is the founding director of the Future of Humanity Institute, a multidisciplinary research institute integrating the tools of mathematics, philosophy and science to bear on big-picture questions about humanity's prospect. Among transhumanist and AI scientists, it is challenging to find any traces of philosophical grounding, but such foundations are an interesting aspect of Bostrom's work. Although as a transhumanist he views human nature as a work in progress and envisages that through the responsible use of science and technology, we will eventually manage to become post-human, an important part of his current work focuses on the potential negative outcomes, such as the widening of inequalities, the erosion of meaningful human relationships, and the diminishment of ecological diversity. He was the author of a 2015 open letter titled "Research Priorities for Robust and Beneficial Artificial Intelligence," in which he both argued for greater investment in artificial intelligence and drew attention to potential pitfalls. "We recommend expanded research aimed at ensuring that increasingly capable AI systems are robust and beneficial: our AI systems must do what we want them to do."

It is certainly reassuring that the issue of choosing where we want AI to go is been debated out there; but knowing what led to the mechanization of mind or to the metaphor of the brain as machine, it is easy to see how AI has gained momentum over the past 60 years, and for this trajectory to be problematic. Two things are puzzling: the extent of the fascination with AI, and the fact that this fascination is paralleled by an exponential increase in anxiety, depression, and other mental health issues in the Western world. It certainly also rise concern in face of our capacity to use scientific knowledge in a reasonable way since this type of knowledge is by it's own definition disembodied: The question of using third person knowledge to do good at the first person level does not seem to flow.

Julian Huxley (1887–1975) first coined the term transhumanism. Huxley was an evolutionary biologist-turned-eugenicist whose brother Aldous (1894–1963) was the author of the novel *Brave New World*. In 1968, he wrote:

The human species can, if it wishes, transcend itself: We need a name for this new belief. Perhaps transhumanism will serve: man remaining man, but transcending himself, by realizing new possibilities of and for his human nature . . . It will at last be consciously fulfilling its real destiny. (Huxley, 1968, p.73)

This fundamental definition has not changed significantly, although it has come, in recent years, to consider the ethics of developing and using technologies to enhance human capacities. One thing is striking: in the face of growing arguments over whether transhumanism is a desirable direction for humanity, we are, on both sides, increasingly incapable of framing both the world we already have created and the one coming into being around us. All too often, our framing is still from the Enlightenment. In other words, we have created the power but not yet the wisdom.

This is certainly not what Socrates had in mind when he advised, “Know thyself”: Instead of a turn inward, humanity’s quest for the good life has followed a steady outward movement toward what was accepted as technological extension (Allhoff et al., 2010). Our biology defines our capabilities and limitations, and human history testifies to our attempts at breaking the bonds of biological restriction (Giordano & Gordijn, 2010).

The argument against enhancement technologies is essentially that there is something intrinsically valuable about human nature, which would be lost if we enhanced ourselves. As Kass (2003) has argued: “We may become *better*, but not necessarily *better humans*.” Such an argument demands a reassessment of the underlying conception of human nature and its relation to technology. Kass, a fierce opponent of transhumanism, has articulated this in interesting terms:

First, one could accept that designing and using technologies is part of human nature. Then, there is no ground for morally questioning any technology based on an appeal to human nature alone. Alternatively, one could maintain that human nature is technology-free. This leads to a general conservatism concerning technology. That attitude has precedents in philosophy and is hardly limited to human enhancement technologies. However, it seems hard to sustain on a closer look at the history of technology. Many technologies have drastically altered human behaviour, yet are now part and parcel of our everyday lives: interventions in schooling, exercise and nutrition are prime examples. If there originally were moral qualms concerning these interventions, they have vanished. (Kass, 2003, p.10)

Interestingly, even amongst opponents of transhumanism there is an admission that moral questioning inevitably dissolves once technological novelty becomes profoundly imbedded in daily life.

Moral conservatives are known to be extremely discomfited by the spectre of moral relativism. They express worries that without a moral framework that preserves its normative content—one with universal applicability and moral truth beyond what is manufactured by social currents of preferences, opinions, or value choices—humanity will be lost. In the face of this moral anxiety, we might need to do what all humans before us have done: critically imagine, evaluate, and experiment with action options and their supporting hypotheses so as to arrive at some clarifications about our moral epistemology. For the bioethicist Paul Wolpe (2002), *enhancement* is such a slippery, socially constructed concept—just as are the concepts of normality, disease, and health—that any exclusive definition of the term is bound to fail. The word obviously bears reference to the dictionary notion of raising or intensifying, but after that point, it is open to interpretation, and this is where all hell breaks loose.

Some bioethicists (e.g., Savulescu, 2011) still wrap concepts of intelligence enhancement in welfarist justifications—for example, that parents have a moral obligation to use genetic and other technologies to enhance their children. Savulescu, an Australian philosopher and bioethicist, is the leading figure in a “new” eugenics that proclaims itself to be pluralistic, based on good science, and concerned with the welfare and respect of individuals and individual rights (Sparrow, 2011).

In this context, it is paradoxical that they link their views with welfarism, a theory of morality centrally concerned with the welfare or well-being of individuals and arguably a variation of utilitarianism (Keller, 2009). Interestingly, most opposition to functional or human enhancement draws upon on conservative virtue ethics theory arguments, and the same seems to apply to some of the extremist proponents of human enhancement. Others, such as Sam Harris, an American philosopher and neuroscientist, argue that a proper concern for the welfare of future human beings implies that we are *morally obligated* to pursue enhancement.

Savulescu, for his part, has found the most twisted way to link enhancements with virtue ethics; he asserts that recent scientific findings have shown that most human beings are subject to numerous kinds of cognitive constraints that, he assumes, stand between them and a virtuous life. Savulescu then manages to conclude that since virtuous life is unattainable for most people, as a direct consequence of their imperfect biology, cognitive enhancement and a firm commitment to virtue ethics as a strategy for a good life are not incompatible (Fröding, 2011).

Many prominent thinkers, including bioethicist Leon Kass, Harvard philosopher Michael Sandal, and political scientist Francis Fukuyama, have voiced objections to such scientific advances. But perhaps the most famous and influential voice is that of the German philosopher and social theorist Jurgen Habermas. In *The Future of Human Nature* (2003), Habermas’s objection concerns the moral status of an individual who has benefited from enhancement technology: “Eugenic interventions aiming at enhancements reduce ethical freedom insofar as they tie down the person concerned to be rejected, but irreversible intentions of third parties, barring him from the spontaneous self-perception of being the undivided author of his own life” (p. 16). This, he suggests,

will have disastrous consequences for interpersonal relationships that are “no longer consistent with the egalitarian premises of morality and law” (p.17) He produces the following support for this argument:

In the context of democratically constituted pluralistic society where every citizen has an equal right to an autonomous conduct of life, practises of enhancing eugenics cannot be “normalized” in a legitimate way, because the selection of desirable dispositions cannot be a priori dissociated from the prejudgment of specific life projects. (Habermas, 2003, p.115)

The question of human authenticity is central here. How does the notion of emotional authenticity intertwine with the notions of naturalness and artificiality in the context of the debate about neuro-enhancement and neurotechnologies? There is a widely held intuition that an artificial means will always lead to an unauthentic result. Yet this might not necessarily be the case. If philosophy of mind usually resorts to thought experiments on such issues, recent literature in applied ethics on enhancements provides good reason to include real-world examples, where people using psychotropic drugs undergo unprecedented experiences of authenticity (Kraemer, 2011). The criterion of natural or non-natural emotion does not seem to lead anywhere valid. Kraemer interestingly has suggested three non-naturalist standards for emotions: the authenticity standard, viewed here as the capacity to focus on the essential things in life and on self-realization; the rationality standard; and the coherence standard.

Charles Taylor (1991) traced the source of the Western world’s ideal of authenticity to Puritanism. This ethic of authenticity demands that each person should strive for self-perfection, actualize hidden potential, and make the best out of life. Described in such terms, authenticity, in a capitalist neoliberalist society, becomes the central focus in the enhancement debate in applied ethics. There are various definitions of the term enhancement in this context, but they generally incorporate all interventions designed to improve human form or functioning beyond what is necessary to sustain or restore good health. The puzzle of authenticity comes down to questions such as: Can a person experience an authentic self by means of artificial enhancement devices? For many, *artificial* necessarily leads to *inauthentic* (Pugmire,1994). The question that inevitably follows is: What is the so-called *natural state* with which artificial approaches interfere? When am I in a *natural state*, neurologically speaking?

There are, today, initiatives promoting the merging of Nanotechnology, Biotechnology, Information technology, and new humane technologies based upon Cognitive science (NBIC) with the open agenda of accelerating human enhancement. We could be entering a new age in the history of the human species, during which people “will live longer, will possess new physical and cognitive abilities and will be liberated from suffering and pain due to aging and disease. In the post-human age, humans will no longer be controlled by nature; instead, they will be the controllers of nature” (Roco & Bainbridge, 2003).

Transhumanist discourse is more present and alive now than when the term was first put forward. If initiatives such as NBIC can be seen as examples of transdisciplinarity, then clearly it is important to define a theoretical framework before inviting the different disciplines to the table and making a pretense at transdisciplinarity. Defining transdisciplinarity as the new state of affairs in human knowledge does not lead to the idea that transhumanism captures the new human condition, as has been put forward by Tirosh-Samuelson (2007). In the case of NBIC, the archaic concept of “human as controller of nature” can easily be discredited, but this perspective still finds adherents amongst neo-liberal entrepreneurs. For Hughes (2004), a vocal transhumanist and author of *Citizen Cyborg*, the redesigned human of the future is at the heart of the techno-politics debate that will mobilize the political terrain of the 21st century, opposing techno-conservatives and techno-liberals. He also argues that transhumanism is already implicit in much of the research agenda of contemporary bio/neurology.

Does what **can** be done always **have** to be done? Well, after much digging, I have not found cases within scientific or technological development where a societal debate would have established guidelines, reinforced shared values, and consciously established limits **before** major societal transformation happened. In trying to find such an example, and before looking further into the transhumanist worldview, I will do a detour into the latest neurotechnologies.

2.2. Neurotechnologies

As part of the *neuro-turn*, neurotechnologies are present in many areas of our lives, and they fall into two broad categories: nootropics (brain-machine interfaces) and deep-brain stimulation (DBS). I will present an overview of these technologies, as they have the potential to affect how we see ourselves in the world.

2.2.1. Nootropics

In North America, students are increasingly using prescription drugs for cognitive enhancement (Howard-Jones, 2010). Nootropics, or “smart pills,” are regarded by some as magic bullets for self-managing one’s brain. Drugs such as piracetam (which promotes memory), modafinil (which induces wakefulness), and methylphenidate (trademark name Ritalin, which accentuates attention) are increasingly being used by healthy people.

The number of regular users of these so-called “smart drugs” ranges from 10% of high school students to between 10 and 35% of college students, depending on campuses (Forlini & Racine, 2009). A 2008 article in *Nature* suggested that about one in five academics also use them (Maher, 2008). Although methylphenidate and Adderall (an amphetamine) are prescribed mainly for the treatment of ADHD, sales figures demonstrate that people who do not have this diagnosis are using them. An obvious ethical challenge to education is that such non-medical use of nootropics is presently viewed as a lifestyle choice, although that lifestyle choice is admittedly made in response to tremendous social pressure to perform in a competitive environment marked by the search for quick fixes (Racine, 2010).

The term nootropics was coined in 1964 by Corneliu Giurgea after the synthesis of piracetam, to describe a new category of molecules characterized by their direct functional activation of the higher integrative brain mechanism. This launched the field of nootropics research, which aimed to find new drugs capable of directly enhancing the efficiency of the brain’s cognitive activity so as to compensate for various neurological deficits related to aging. The specificity of this compound, enabling it to stimulate cognitive activity without affecting other systems (as is generally the case with psychotropic

drugs), inspired the name—noos=mind, tropic=toward (Giurgea, 1982)—and opened up a new category of psychopharmacological agents. The saga of the discovery of this first nootropic, from synthesis to human trial, is representative of the field, starting with the creation of a molecule based on an erroneous hypothesis: that the neurotransmitter GABA could yield a new sedative (piracetam). While it did not induce sedation, it was found to be non-toxic and devoid of any common psychopharmacological, cardiovascular, or respiratory side effects. Moreover, in animal studies, piracetam facilitated learning and memory in both normal and deficient animals, and it protected the learned material against amnesic agents. Animal studies then led to human studies, whereby a correlation was established between pharmacoclinical and neurochemical activities. This reoriented the research program towards hypotheses based on the potential beneficial effect of piracetam on mental activities associated with callosal-dependent transfer of information (i.e., requiring the corpus callosum), promoting communication between the two hemispheres.

By 1976, studies had shown potential applications for dyslexic children, and by 1980, other studies had indicated that piracetam could be effective in compensating for specific age-related short-term memory impairment. Today, piracetam is one in a long list of nootropics that act on a variety of neurotransmitter systems to enhance attention. Although there are no generally accepted mechanisms for these types of nootropics, the increase in memory capacity is based on the same action as occurs with an acetylcholinesterase inhibitor, a chemical that inhibits the breakdown of the neurotransmitter acetylcholine.

Nootropics have transient effects on healthy individuals, yielding only moderate effects and enhancing only a subset of cognitive abilities. But there is a growing literature arguing that in the actual socio-political context of neoliberal politics, neuropharmacology will continue to cross the boundaries of therapy. Nootropics aim to enhance short- and long-term memory or, more generally, executive function—the cognitive systems that oversee processes involved in planning, thinking abstractly, inhibiting action, and so on. A brief history of the chain of events behind the lab synthesis of nootropics and their later use by the general public reads like a novel: white

coats, false hypotheses, random discoveries, unexplained results, animal and human trials, money, and politics.

The case of amphetamine and its generalized non-medical use preceded the nootropics era. In 1929, a synthetic molecule similar to the Chinese herb ephedrine was introduced for medical applications. During World War II, amphetamine was widely used by the military in several countries. Although users self-rated their performance highly on tasks involving speed, studies revealed that their actual scores were not higher than those earned by subjects who ingested caffeine, and in fact were lower in the case of more complex tasks. It is the mood-elevating effect of amphetamines that makes users feel they are performing especially well (Rasmussen, 2008). Today, the medical use of amphetamine is banned in every country except the United States.

In exploring how nootropics evolved from medications to non-medical cognitive enhancers, it is important to put in context the massive research effort invested into these neuropharmacological molecules in response to the rise, in developed countries, of the cognitive impairment associated with Alzheimer's disease (AD). To date, there is no unanimous agreement about the etiology of or cure for AD. Nootropics, whose neurological activities are similar to acetylcholinesterase inhibitors, were used in response to the cholinergic hypothesis, the first proposed explanation for the onset of AD. In brief, this model suggested that AD could be caused by a reduction in the synthesis of acetylcholine. This neurotransmitter is normally metabolized by enzymes called acetylcholinesterases, acting as messengers in the synapse between two neurons.

The nootropic's effect, by reducing the activity of those enzymes, was to maintain and/or improve the communication between neurons in specific zones involved in short-term memory and attention. The cholinergic hypothesis was no longer viewed as valid, as it addressed only the symptoms of AD but not its cause(s). Still, the groundwork was done, paving the way for the use of this and other nootropics to enhance cognition in non-medical contexts.

When nootropics are used for medical purposes, it is taken for granted that the benefits of the treatment will outweigh the side effects. For example, if a person shows

signs of the onset of AD, and a nootropic such as Donepezil (part of the piracetam family) improves short-term memory and in doing so improves the person's quality of life, the fact that the drug also induces side effects ranging from nausea to headaches and insomnia will be minimized. But how should one deal with the side effects of nootropics used non-medically? Is this type of cognitive enhancement worth the side effects? De Jongh, Bolt, Schermer, and Olivier (2008) provided an in-depth analysis of the side effects involved in the use of nootropics, which include not only the diverse physiological symptoms mentioned above, but in some cases detrimental cognitive impacts that obviously make the non-medical use of nootropics questionable.

These cognitive side effects fall into three main categories. First, as cognition-enhancing drugs, they can simultaneously exert both linear and quadratic (U-shaped) effects. Doses most effective in facilitating one cognitive function could thus at the same time have no effect or even detrimental effects on other cognitive domains. Second, individuals with "low memory spans" may benefit from cognition-enhancing drugs, while "high-span subjects" may overdose. Finally, evidence suggests a number of trade-offs—for example, an increase in cognitive stability might come at the cost of a decreased capacity to flexibly alter behaviour. Other research suggests that these drugs do not improve the retention of learned information (Grön, Kirstein, Thielscher, Riepe, & Spitzer, 2005).

Even though these facts could potentially cool the enthusiasm surrounding nootropics, the pharmaceutical industry is investing massively in research to produce such drugs to satisfy the market. The second generation of memory-enhancing drugs is targeting not the cholinergic mechanism but brain neuroplasticity by inducing long-term potentialization in relevant neurons or in the formation of memories, by increasing the amount of a protein called CREB, which strengthens the synapse and helps to consolidate memories (Reiner, 2010).

Researches looking into memory and other cognitive functions is supported by massive investment: Pharmaceutical industry is again gearing up, just as it had in the Western world for most of the 20th century. From Valium in the early 1960s, to LSD by the mid-1960s, and then the urge in the 1970s to medically invade every territory of

human emotion, behaviour, and cognition, the desire for chemical forms of self-control and self-betterment has pervaded the medical and public domains. The wave of Ecstasy use in the early 1980s has been dubbed the Second Summer of Love and was followed by Prozac in 1987, a drug that marked the re-emergence of the “pill for every ill” culture, with its strong image of personal self-repair or “optimization” (Shermer, 2009). In this case, the occurrence of side effects, and claims of success that failed to materialize, did not raise public awareness.

The demand is still alive and well. The use of drugs to enhance human functioning obviously raises numerous ethical concerns that have to be addressed even if the actual potency of the first generation of nootropics seems to induce more side effects than any real enhancement. It is easily foreseeable that under the aegis of perfectly legitimate medical concerns to treat and prevent disease, the next generation of nootropics will emerge as readily available enhancers for non-medical uses (Shermer, 2007).

The major societal issues of nootropics have been described by Illes (2006b) as forming four main categories of ethical challenge: safety, coercion, distributive justice, and personhood. She readily admits that in the ethics of neurocognitive enhancement, we are “still feeling our way towards relevant principles.” The resultant questions force us to revisit our diverse ethical premises. Does hard work confer “dignity”? Am I the same person when on Ritalin? There is much more involved here than rules and regulations. Yet the use of nootropics is spreading on the *belief* that they will provide improved performance.

The work market’s expectation that people be “wired” day and night is an obvious coercive force. On the other hand, restricting the use of nootropics could also be seen as coercive, as denying people the freedom of choosing to enhance themselves or not. Distributive justice also has to be addressed, since the use of nootropics obviously contributes to unfairness between haves and have-nots. With society already full of such inequities, from private tutoring to cosmetic surgery, this is not an issue specific to nootropics until we add the question of whether enhancement in itself is a form of cheating, which is a more specific aspect of nootropics than the inequity factor.

Cheating, when defined as breaking implicit rules or gaining unfair advantages, carries *de facto* moral wrongness. Most discussions on the unfairness of enhancement have emerged with respect to competitive sports, since performance enhancement is an intrinsic goal of sports (Schermer, 2008). In this case, cheating is addressed by changing rules and instituting controls and sanctions, as well as conducting a rigorous reassessment every time a new form of enhancement comes around, the main evaluation criteria being safety, fairness of access for all athletes, and respect for the constitutive rules of the sport. Also tricky is the notion of deserved victory based on merit or natural abilities, which can include the smart use of technologies. In fact, the weakness of the cheating argument is that enhancement does not eliminate work but merely changes its nature.

In the school system, nootropics are bringing the cheating argument into the classroom. As Turner and Sahakian (2008) argued, although the use of nootropics affects the constitutive rules of learning, it should be viewed in the broad context of education as a whole rather than in relation to the cliché of students on Ritalin or ampakines, cramming for exams. In fact, as I will further argue, it might very well be an opportunity to assess the relevance of a school system based on very narrow aspects of what education is all about.

As Farah (2005) argued, compared to drugs used therapeutically, enhancement drugs have less acceptable side effects. It also seems unrealistic or simply naïve to assume that the person taking them is adequately informed about the risks, since that assumption doesn't take into account the societal pressures encouraging the drugs' use. The risk is greater here than in other forms of enhancement, since it involves intervening in a far more complex system, with greater chances for unanticipated problems.

The use of nootropics takes the question of personhood or personal identity to another level. For example: "Am I the same person after drinking a bottle or two of wine?" "Am I the same person when I'm on Ritalin?" "Am I the same person after I have a brain implant?" Are the self-transformations that we effect by neurocognitive intervention really self-actualizing, or are they eroding our personal identity?

Taylor's (1989) description of the modern self—as rooted in an ideal of self-control and self-making, with the authentic self residing in one's own uniqueness and individuality and one's desire to be true to this self—has been pushed further in what Vidal (2009) described as the passage, under the influence of mainstream neuroscience, from personhood to brainhood, whereby the brain is the location of the “modern self” in Westernized societies. While one might have suspected people to distrust how drugs can interfere with one's states of consciousness, this does not seem to be the case, something Maasen and Sutter (2007) have attributed to the current obsession with self-management practices; in this context, nootropics are the new tool in the toolbox.

While there are numerous ethical implications of using nootropics to enhance cognitive function, these drugs are also closely related to their context: they have emerged amidst an idealistic libertarianism postulating that people will be sufficiently educated to be able to make informed personal decisions. But educated about what?

Because we suffer from a chronic tendency to misconstrue the relation between our self-conscious choosing and the vast webs of non-conscious activities and until we form a better, more consistent image of the relationship between these factors, we cannot hope to know ourselves. (Clark, 2003, p.3)

Clark is arguing here from a humanist standpoint supporting the concept of ‘ourselves’. In my current examination of transhumanist thoughts, the benefits of “knowing ourselves” seem to equate a “self” as defined by Big Data more than by introspective, existential and subjective exploration.

2.2.2. Deep brain stimulation

Deep brain stimulation (DBS) is a form of neurotechnology that interacts not with the biochemistry of the nervous system, as nootropics do, but with the electrical potential of neural activity. DBS uses a battery-operated medical device or neurostimulator implanted deep inside the brain to deliver electrical stimulation to targeted areas of the brain that control movement. I can't think of a better description of this neurotechnology than the one provided by a friend of mine who lives with a DBS brain implant to deal with the symptoms of Parkinson's disease. He wrote a moving description of his experience,

reaching beyond technical information to address existential questions attached to neurotechnology. This is a brief excerpt:

“Who’s going for takeout?” I wisecrack while lying immobilized, scalp peeled back, brain exposed, after having my head cored like a bowling ball.

This false bravado is my way of dealing with the trauma I am experiencing from the Deep Brain Stimulation (DBS) surgery being performed on my cranium. Within the next few minutes my guardian-angel nurse who has been holding my hand and doing her best to keep me engaged throughout this seven-hour ordeal will be dabbing my eyes as I switch gears from exchanging friendly banter with her and the anesthesiologist to crying uncontrollably.

This particular crying jag has been brought on not by the recognition that DBS surgery could really enhance my life and ease the burden of Parkinson’s disease, but by my realization that evil regimes and their cruel henchmen have been doling out similar operations without local anesthetic on innocent men, women, and children since the beginning of time. These conflicting thoughts concerning the good, the bad, and the ugliness of man’s inhumanity to man have reduced me to tears. Indeed, having one’s head drilled while being awake is not a procedure I would want even my worst enemy to go through.

The doctors assure me that this part of my surgery won’t hurt a bit due to the local anesthetic. However, I’m also advised to keep my mouth ajar when the drilling starts and not to clench my jaw, unless I want to grind my molars to dust. For over two weeks after the surgery, my jaw still ached when I yawned.

Trust me, you do not want to ever feel the vibrations of a drill digging deep into your soul or recall the smell from your smoking skull. Even some of the veterans of the operating room looked away or found something else to occupy them when the drilling began. It was one of the toughest days of my life, and no amount of reading up, talking to, or listening to any others can prepare you for your date with DBS.

DBS surgery involves the drilling of two quarter-size holes on each side of your skull. Two electrodes are implanted, the effects seen on the opposite sides of your body.

The electrodes are then attached to a stimulator (similar to a pacemaker) buried underneath the chest skin that can be turned on and off. Surgical operations once caused permanent lesions in the affected areas of the brain, but since the late 1990s this procedure has been supplanted by deep brain stimulation, which has the advantages of safety, reversibility, and adjustability.

My date with destiny starts at 5:30 a.m. with a shower, and at 6:30 the porters arrive to wheel my bed to the CT lab for the mapping of my brain. The first step of my operation involves the placement and fitting of the stereotactic head frame. This medieval-looking cage, which resembles something you would see in the chamber of horrors in Madame Tussaud's wax museum, is bolted to my skull at four points in order to immobilize my head for the duration of my operation. The insertion of the sharp needles hurts until the local anesthetic numbs my skull, a convergence of state-of-the-art brain surgery and old-fashioned mechanical surgery. The head-frame apparatus will be bolted to the operating table to hold my head in a fixed position. I realize that my upcoming DBS surgery means little to the busy staff performing their daily tasks, but I have made my bed and now I must lie in it!

Next it's into the scanner and its roller-coaster ride, complete with laser lights and overwhelming sound effects. There are a couple of events that I recall vividly. During a particularly crucial phase of my operation, I feel a dry tickle in my throat, and I begin to cough uncontrollably. This is not good, especially when the surgeons are attempting to insert, with millimetre accuracy, an electrode deep within my brain. The operation comes to a standstill, and there is a hush in the room. I feel at this point that my life could be in danger as I fight to suppress my cough.

After the right side of my brain has been drilled and the electrode implanted, Honey informs me that it's my turn to contribute to the proceedings. This is why I have been kept awake: now I must answer questions about how I'm feeling. It is also an opportunity for the team to test my range of motion when the electrical current is applied. As the current is turned up, a wave of pinpricks flows down my left side. Honey rotates my left wrist as we engage in a discussion about the looseness of my wrist joint. After we establish a comfort zone for full range of motion, one of the fellows is instructed to turn up the dial to find my top end. As the current strengthens, I feel my left eye start to twitch and my cheek tighten around my mouth.

After the first electrode has been set in place, the procedure is repeated on the opposite side.

Near the end, while my scalp is being sewn back together, the nurses begin to clean up the room. I hear some whispering about the whereabouts of a surgical sponge. This talk escalates into a full-blown search. I listen intently to this crisis unfolding behind me and finally bid the attending fellow to stop sewing and come around and get in my face. I ask him point blank: "Is there a sponge left in my skull?" He calmly informs me using his thumb and forefinger that my burr holes are about the size of a quarter and the missing sponge is 20 centimetres by 10. Soon after, the sponge is recaptured and the universe is again unfolding as it should.

As I drift into unconsciousness for the final hour of surgery, I call out to all those responsible my thanks and a “See you later, bye-bye.” I’m woken in the recovery room to find I am now the proud owner of a stimulator embedded in my chest with visible wires running under my skin, behind my ear, and into the battery pack. After the first night of morphine and hourly wake-up calls from the nurses to test my vitals, I’m on the road to a quick recovery. I’m back on my full medications, 23 prescription pills per day.

I won’t know if my operation has been successful until my brain swelling goes down enough to allow for the start-up of my stimulator. This process will start before the end of August and could take weeks, even months, to test, set the levels, and have my meds adjusted to an appropriate level.

Was it all worth it? There is no guarantee of success, and there were certainly points in the process when I would have gladly opted out. But the promise and the hope for improvement in the 30-to-70-percent range were just too tempting to pass up, even after 15 months on the waiting list.

It’s the hope of better quality of life to share with my family and friends that drives me forward. I’m lucky to have the option of treatments like DBS surgery, and as I look farther ahead to the possibility of stem-cell-research breakthroughs, not having or believing in these options is what would really scare me. (Moore, 2007)

The scientific foundations of DBS research were established decades ago, mostly by medical doctors, neurophysiologists, and psychologist. The sharing of Moore’s experience of DBS here bring about the complexity of the personal recount of benefit from neurotechnologies against the background of societal issues of fairness (who can gain access the technology) and side effects (can be greater then the benefits). But again, things are not that simple. The story ends after the surgery and does not go into the fact that DBS can be associated with complex, unintended effects on mood, cognition, and behaviour (Nuffield Council on Bioethics, Novel neurotechnologies: intervening in the brain, 2013).

When interdisciplinary research is involved, however, matters become worrisome. In recent contributions from other fields, such as human–computer interaction (HCI), electrical engineering, computer science, and artificial intelligence, numerous innovations have focused on non-medical applications (e.g., gaming, military use, and workplace devices), all of which have brought to light some controversial topics and potential roadblocks.

2.2.3. Human–computer interaction

First some definitions. Devices that can read brain signals and convert them into control and communication signals are called brain–computer interfaces. By locating electrodes directly on the motor areas of a person’s brain, it is possible for the person to accomplish an external task without having to move. Back in the 1960s, controlling devices with brain waves was considered pure science fiction. Although recording brain signals from the human scalp had gained some attention in 1929, the required technologies to process these signals were still too limited. They have gained momentum in the past 10 years. A brain–computer interface, or BCI, relies on the user’s intentional control and is part of the larger category of neuroprosthetics. The interfaces not only receive output from the nervous system but also provide input, via electrodes that can be non-invasive or invasive, depending on their location (on the scalp, on the surface of the cortex, or even deeper in the brain, within the cortical tissues). BCI is based on selective attention and requires the system to provide external stimuli. Most of the applications require the use of neurofeedback techniques, as it is now well established that people can learn to control various parameters of the brain’s electrical activity through training processes that involve the real-time display of ongoing changes in their EEGs.

There are two main categories of BCIs, based on the amount of “will” the user has to exert in order to produce the requisite signal in the EEG. BCIs that rely on the user to self-regulate certain brain patterns are called active BCIs. Those that rely on ongoing brain activity (e.g., arousal level) while the user is not wilfully producing signals or attending to any special stimuli are called passive BCIs (Zander, 2010). These methods have been widely applied for clinical benefit (e.g., to manage epileptic seizures), using the enhancement or suppression of particular features of an EEG that correlate with establishing a “normal” state of brain functioning (normal being used here in a statistical context). Other studies have shown that children with ADHD had improved behavioural and cognitive variables after frequency training in neurofeedback (Clarke et al., 2011).

Unlike nootropics, brain–machine interfaces are still far from being mainstream but not so far as to be ignored for their potential ethical implications in education. An exhaustive list of ethical issues raised by BCI has been established by Nijboer and colleagues (Nijboer et al., 2010), serving as one of the first steps in a long-range attempt to clarify the views of at least a segment of the BCI research community, as the authors clearly invite that community to join in the field of neuroethics. It is worth providing their list, as I will further look into some of the issues that apply to both nootropics and BCIs:

1. obtaining informed consent from people who have difficulty communicating;
2. risk/benefit analysis;
3. shared responsibility of BCI teams (e.g., how to ensure that responsible group decisions can be made);
4. the consequences of BCI technology for the quality of life of patients and their families;
5. side-effects (e.g., neurofeedback of sensorimotor rhythm training is reported to affect sleep quality);
6. personal responsibility and its possible constraints (e.g., who is responsible for erroneous actions with a neuroprosthesis?);
7. issues concerning personality and personhood and its possible alteration;
8. therapeutic applications, including risks of excessive use;
9. questions of research ethics that arise when progressing from animal experimentation to application in human subjects;
10. mind-reading and privacy;
11. mind-control;
12. selective enhancement and social stratification;
13. human dignity;
14. mental integrity;
15. bodily integrity;
16. regulating safety;
17. communication to the media.

Nijboer et al. (2010), after an exhaustive survey of the field of BCI, expressed the view that, like neuroscientists, BCI researchers may have good reasons to wade only reluctantly into ethics or theoretical frameworks. First, there is the fear that the questions

raised are likely to be open-ended—which rules out any interest in transdisciplinary methodology. Second, the use of these neurotechnologies outside the laboratory may still be some way off. An important aspect here is the risk of engaging in speculative modeling. The discourse of speculative ethics (e.g., What if we start downloading data in your brain when you are asleep? What if someone can adjust your moods via your deep-brain implant?) is a liability in many ways, and it implies the risk of squandering valuable resources of ethical concern by engaging in philosophical thought-experiments that are highly hypothetical compared to more likely technical developments (Nordmann, 2007).

In parallel to these technologies, emerging neuroscientific research explores strangely familiar non-technological forms of enhancement such as attention and self-regulation, both significantly improved by various meditative approaches. The potential regulatory function of these meditative practices on attention and emotion processes could also have a long-term impact on behaviour (Lutz et al., 2009; Sheridan, Zinchenko, & Gardner, 2005; Tang et al., 2007). Needless to say, very little attention and financial support is given to these avenues. What makes headlines is, for example, Kevin Warwick, Professor of Cybernetics at the University of Reading, England, making a statement on the latest about HClIs and the imminent reality of brain-to-brain communication:

In a human case, with the subject in New York City (Columbia University to be precise) they were able to control the movements of a robot hand in England (Reading University) by means of their own neural signals fed through an implanted electrode array. Coupled with that, in a series of experiments, they learned to perceive sensory data from the robot hand fingertips in order to apply a closed loop control. **This means for humans that a person's brain and body do not have to be in the same place.** . . . Perhaps the most encouraging of those upgrades already tested would be in the field of communications. Although technology (the telephone for example) has enabled the distances involved to be increased dramatically, it is still the case that signals such as emotions, feelings, thoughts, images, concepts, and so on cannot be transmitted from brain-to-brain communication. Fortunately experiments, involving direct radio telegraphic communication between human nervous systems system, have proved to be successful and as a result, we can look forward to the first brain-to-brain communication before very long due to ongoing research in this direction. (Warwick, 2014, p.4)

2.3. On our capacity to do good with science and technology

When wondering on our capacity to do good with science and technology, no societal debates or ethical concerns came in the way of dropping a nuclear bomb on Hiroshima and Nagasaki in the 20th century. Questions and debates did not precede these dramatically destructive events; they only came after the facts. The United States and the United Kingdom signed the Quebec Agreement in 1943 to join efforts and technological capabilities to develop nuclear weapons in the midst of World War II, a joint effort that led to the first testing of a nuclear bomb on 16 July 1945. On 6 and 9 August 1945, nuclear bombs were dropped on Hiroshima and Nagasaki, exposing in full light the folly of knowledge created, in full third person by scientific inquiries totally submitted to political imperatives. Logical positivism was the dominant approach to resolve problems and those were no times for endorsing uncertainty and fallibility.

During the 1950s, discussion about scientists' moral responsibilities became impersonated, to some degree, in the physicist Robert Oppenheimer. He became identified with a few others as the father of the bomb and was said to have been profoundly perplexed after 16 July 1945, when a nuclear bomb was tested in the desert of New Mexico. Or was he? In his writings after the war, Oppenheimer kept questioning the difficulty of managing the power of knowledge in a world where the freedom of scientists to openly debate critical issues was falling under the control of political agendas. In this context, his 1953 publication of *Science and the Common Understanding* made him a political pariah. The voice and tone of his writing offers a glimpse at this historical figure:

Science has changed the conditions of man's life. It has changed its material conditions; by changing them it has altered our labour and our rest, our power, and the limits of that power, as men and as communities of men, the means and instruments as well as the substance of our learning, the terms and the form in which decisions of right and wrong come before us. It has altered the communities in which we live and cherish, learn and act. It has brought an acute and pervasive sense of change itself into our own life's span. The ideas of science have changed the way men think of themselves and of the world. (Oppenheimer, 1953, p.15)

I want to focus here on the disjunction between “the way men think of themselves” **and** “of the world” as a divide that I further identify in today’s transhumanism. In fact, the entire metaphor of humans as machines suddenly feels old. I include his words here as part of my wondering about whether the current unquestioned investment in AI research bears similarities to other scientific disasters. Oppenheimer seems to have been able to question the unqualified value of science:

The example of rapid progress in understanding may lead men to conclude that the root of evil is ignorance and that ignorance can be ended. All these things have happened and all surely will happen again. This means that, if we are to take heart from any beneficent influence that science may have for the common understanding, we need to do so both with modesty and with a full awareness that these relationships are not inevitably and inexorably for man's good. (Oppenheimer, 1953, p.21)

But his interrogations apparently remained theoretical:

When you see something that is technically sweet, you go ahead and do it and you argue about what to do about it only after you have had your technical success. That is the way it was with the atomic bomb. (Oppenheimer, 1954, p. 81)

Oppenheimer later insisted that some of his work in theoretical physics had common roots with Buddhist and Hindu thought. In 1945, after witnessing the first testing of a nuclear bomb, he referred to the Bhagavad Gita: “Now, I am become Death, the destroyer of worlds” (Hijiya, 2000, p.123). Very few researchers other than Hijiya (2000) have contextualized Oppenheimer’s reference to Hindu text. As he suggests, Oppenheimer came to be interested in Hindu scripture as a young adult, potentially more as a reaction to the imposed religious beliefs of his family than as a determining influence on his views as a scientist. Hijiya insists that beyond Oppenheimer’s public declarations and written work, he left almost nothing personal for us to know how he really felt about his scientific contribution.

Although in his William James Lectures of 1956–57, Oppenheimer tried to express what he had come to understand, his words maintained that science is the agent of progress. In light of this dramatic example showing how wrong the endeavour of disembodied science can go, I reaffirm my worry in the face of current technological races and my concerns about the capability of scientists, still operating within a disembody worldview,

to make AI systems that do what we want them to do. There seem to be a possible parallel between Oppenheimer and current transhumanist engineers of AI in terms of unquestioned race forward. Even if it is true to say that the decision of using nuclear weapons against Japan was a political decision, many physicists at Los Alamos did voice moral objection to the project and did walk away. I question the driving force behind the one who stayed and did the work – because many directions taken today remain unquestioned.

2.4. On technology and human evolution

Our species' journey is a fascinating story, a well-known tale, but one from which we too often abstract ourselves. I find it important to immerse myself in an evolutionary perspective. A walk through the cave called El Castillo on the northern coast of Spain: looking at art on the wall of a cave, in the dim light making its way inside, one can't help but imagine an impossible journey back in time, 12,000 years ago. What do these carvings reveal of the mysterious world in which these hunter-gatherer people moved? Some researchers have noticed puzzling resemblances in the style of these petroglyphs across different continents. How can this have happened?

These similarities in artistic expression could be explained by our common origins; research has suggested that it could be the result of the genetically inherited structure of the human brain (Bandi, 1961). Reports of neural transformation paralleling Early Stone Age tool-making and cognition in human evolution are showing how human brains and technologies have been coevolving for at least the last 2.6 million years, when the first intentionally modified stone tools appeared (Stout, Toth, Schick, & Chaminade, 2008).

Until 10,000 years ago, most humans lived as hunter-gatherers in small nomadic groups. The advent of agriculture led to the formation of permanent human settlements, the domestication of animals and the use of metal tools. Agriculture encouraged trade and cooperation and led to complex societies. (McClellan & Dorn, 2006). About 6,000 years ago, states developed in Mesopotamia, and in the Nile and Indus Valleys. Military forces were formed, and government bureaucracies. States cooperated and competed

for resources. Around 2,000–3,000 years ago, some states, such as Persia, India, China, Rome, and Greece, developed through conquests into the first expansive empires.

The late Middle Ages saw the rise of revolutionary ideas and technologies. In China, an advanced and urbanized society promoted innovations and sciences. The Islamic golden age saw major scientific advancements in Muslim empires, not to mention the determinant role of Islamic philosophers in preserving Aristotle's work, which would dominate the non-religious thought of the Christian and Muslim worlds. In Europe, the rediscovery of classical learning, and inventions such as the printing press, led to the Renaissance in the 14th century. The Oriental and Occidental engagement up to this point reinforced the fact that the Renaissance was the result of the integration of Eastern philosophy into the Western world (Smith, 2007). In the Western world, as the scientific revolution of the 17th century unfolded, a bewildering array of technologies were put forward. On an evolutionary scale, we have remained almost unchanged physiologically. How we perceive the world and react to it, through our senses, has not altered in such a short evolutionary time, but what has evolved in a phenomenal way is our conceptualization capacity, brought about by language. It is not my objective here to look into the role of language in how we experience the world, but I find it necessary to acknowledge this element. As Polanyi describes, we can interpret the use of tools and probes as instances of the art of knowing, and may add to this list the use of language as a kind of verbal pointing (Polanyi, 1967).

The thread going from petroglyphs to philosophical thinking is undoubtedly the quest for answers about what it means for *Homo sapiens* to be human. Bai's (2006) description speaks eloquently of the origin of this questioning:

If human beings did not see their being in the world as problematic, as needing a fresh reconceptualization, then such a question would never have been asked. That the problematization of life and the universe rather suddenly emerged 25 centuries ago seems to suggest that, prior to this time, human beings lived, rather unquestioningly, therefore unself-consciously, within the prescribed, inherited worldviews of their ancestral cultures, be they Olympic mythologies, the Hindu cosmology, the tales of the Chinese Yellow Emperor, or the story of Ravens. The world and human life were a determinate given, set forth and by and large managed by forces outside humanity; the most that human beings could do was to

follow obediently heaven's will (or however it was known to different groups). We might characterize this mode of being in the world as heteronomy. Heteronomous human beings would not conceive of themselves as having an individual inner core of freedom to will their own action in accordance with independent thoughts and interpretations about the world. All this changed, however, somewhere between the sixth and fourth centuries BCE. Many refer to this remarkable period as the "Axial Age" and mark it as the advent of philosophy in both East and West. . . . Confucius (551–479 BCE) and Lao-tzu (6th century) in China, Siddhartha Gautama (563–483 BCE) in India, Zarathustra (ca. 628–ca. 551 BCE) in Persia, and Socrates (470–399 BCE) in Greece—attracted students and disciples and formed schools and learning communities. Different schools mean different cosmologies and speculations about human nature and about the best ways to conduct human life. . . . Incited by these exemplary teachers, humanity entered, perhaps reluctantly, the young adulthood of self-responsibility and self-care. (Bai, 2006, p.9)

From the first days of tool making, humans have not stopped creating objects that have, in turn, transformed them deeply. Somewhere along the way, self-responsibility and self-care might have been lost or perhaps traded for what ultimately was going to provide ontologies putting us as distinct from animal and as the measure of all things. In the technological developments that led to today's human–machine relationship, to transhumanist views and dreams of singularity that more or less leave humans in the dust, the emergence of an object-oriented ontology seems to provide a chance for examining a radically non-anthropocentric account of the world "that restores ontological priority to all things, without asking what things mean for humans" (Snaza, Weaver, 2015, p. 6). Braidotti, a philosopher whose work interweaves social and political theories, has eloquently described in her 2013 book *The Posthuman* that humans need not be left in the dust in such a non-hierarchical ontology as posthumanism: "we need to become the sort of subjects who actively desire to reinvent subjectivity as a set of mutant values and to draw our pleasure from that, not from the perpetuation of familiar regimes" (p. 93). Braidotti has a unique way of negotiating the passage from humanists' anthropocentrism toward postmodernism, without shying away, as I would, from the word cyborg. She describes a cyborg as "an embodied and socially embedded human subject that is structurally inter-connected to technological elements or *apparati*" (Braidotti, 2002, p. 17). Looking further into how already intricate today's literacies are with those *apparati* or machine interfaces, Stephen Petrina, philosopher of education and professor of media and technologies studies, does not see any way but forward in exploring further, in all

direction, without using narrow definitions of literacies or technologies or “machineries.” In describing machineries as both phenomena and noumena, Petrina departed from the concept of machineries as independent objects by defining them as nothing less than functional processes: “Machinery is the facility to process and diffuse, which implies material, metaphoric, and metaphysical substrata” (Petrina, 2014, p.31). He continued describing his concept of postliteracy:

It is uncertain whether the free will is there to do battle for literacies in the way one battles for literature. When the tide turns, literary technologies and technological literacies need redefining. . . . All things considered, I want to be preterliterate and machinic. (Petrina, 2014, p. 38)

In such non-anthropocentric ontology, posthumanism appears as a way to move past the inherent contradiction of the humanist project where human are the measure of all things. Framing human–machine relations within object-oriented ontology seem to give us more humanity than we had when struggling to position ourselves on the top seat of some metaphoric ladder. Posthuman ontology seems to take shape also at a time in history where the disconnect, the not-in-the-world, becomes unbearable to a civilisation beginning to feel lonely in the middle of much desolation.

Summary

Transhumanist views are deeply imbedded in the neuro-turn that swept humanities in the late 1990s and early 2000s. The development of neurotechnologies seems to be driven mainly by the age-old fear of death, which humans have tried to manage through mythology, then religion, and now science. Taking into consideration this perspective, combined with the current neoliberal economy, I question our ability to do good with science and technology and suggest that posthumanism, with its radically non-anthropocentric account of the world, might help define an ontology that frames human–machine relations in ways that enrich our humanity.

2.5. Postscript

What is a borg, I wonder? Is it just a fictional character, a member of a race of cybernetically enhanced beings? I'm suddenly worried. Since we have not yet, collectively, made sense of our conscious and unconscious lives, of our interconnectivity and societal dynamics, it seems to me that to go on to merge our brain with machines would be a missed opportunity. We would miss on the opportunity of operating an *in-turn*. Last call, who's on board? Like in the poet evocation of our individuality and subjectivity, life shrink down to very little when you are a borg.

Poem 2. Embarrassment – B. Shaughnessy (2003)

4. The Principle of the Borg by B. Shaughnessy

Saying "There's no one like me"
accomplishes the exact opposite
of what you mean.

It is true only insofar as it is true
for everyone equally

So it means you are not special
in any way. Which should be enough for you.

Chapter 3.

Neuroethics: Exploring the rabbit hole of sub-disciplines

Overview: In this chapter, I recount my venture into neuroethics, the most recent subdiscipline of applied ethics currently trying to align the use of neurotechnologies with human value systems. I joined the International Neuroethics Society where I rapidly came to wonder whether, within neuroethics, neuroscience might be part of the problem and at the same time provide answers. The question arises from the paraxial fact that neurotechnologies are generating ethical challenges and at the same time, promote a neuroscientific understanding of ethics. Upon reflection, I am inclined to think not since ethical questions related to my brain are not distinct from ethical question related to myself in relation to others, a simple fact that a subdiscipline risks missing because it focuses on the particular of the biological explanation of ethics at the cost of the bigger picture – the complexity of societal construct involved in the elaboration of our moral judgment. As I will discuss further in this chapter, even if the proposed pragmatic naturalism for neuroethics (Racine, 2010, p. 53) is an invitation to share voices and concerns, it is developing within a strong disciplinary hierarchy that is far from achieving transdisciplinarity.

3.1. Neuroethics: The context of its emergence

From an ethical and pragmatic standpoint, there are broad implications of some neurotechnologies, such as neuro-stimulation, neuropharmacology, and neuroimaging. Given such broad implications, it is clear that communication and public discourse must also broaden to include the perspectives and experiences of all those concerned (...). This is essential because citizens and patients are experts with respect to their own experiences and lives.
(Racine, 2014, p.216)

I started looking for an ethical framework and in order to do so I joined the International Neuroethics Society (INS) in 2011 to see for myself how neuroethicists were framing those issues. At first, I found it interesting to see the diversity of views that seemed to successfully cohabit. Julian Savulescu, philosopher and bioethicist, was at the 2008 Annual Meeting of INS, presenting what would become the main argument in the book *Unfit for the Future: The Need for Moral Enhancement* (Persson, Savulescu, 2012). His idea was that since our moral psychology lags far behind our technological advancement, we urgently needed to explore neurobiotechnologies to achieve moral bioenhancement:

We shall contend that in order for the majority of citizens of liberal democracies to be willing to go along with constraints on their extravagant consumption, their moral motivation must be enhanced so that they pay more heed to the interests of future generations and non-human animals.

. . .

The moral improvement achieved by traditional methods of moral training in the 2,500 years since the first great moral teachers, e.g. Buddha, Confucius, and Socrates, appeared falls short, and effective means of moral bioenhancement are not yet in the offering. . . . So we suggest that we should explore whether our growing knowledge of biology, especially genetics and neurobiology, could deliver supplementary techniques of moral enhancement, such as pharmaceutical drugs or genetic modifications. (Persson & Savulescu, 2012, pp. 2–9)

A plea for neurotechnological moral enhancement, I felt, was a strong critique if not a complete discrediting of the role education plays in society. It would deny the role of education as intervention ‘an intervention in someone’s life motivated by the idea that it will make this life somehow better’ (Biesta, 2006, p. 2). It also implied a phenomenal trust in technologies, as if technological development was value neutral and always used to achieve maximum benefit for humanity. Would someone challenge Savulescu’s view? Under the same roof that day at INS was a discussion on the ethics of deep brain stimulation (DBS), led by Joseph Finns, a physician and medical ethicist. Finns argued for systemic reform to keep market forces out of scientific research in DBS, suggesting that intellectual property transfer should not occur until Phase II, the stage in the development of a treatment where tests are made on real patients and not on volunteers like it is the case in Phase I. His argument was based on the recognition that there seem to be very close ties between the handful of trained functional neurosurgeons and the

bioengineering industry. I found he was bringing an important and well-documented focus on collusion - commercial interest never very far from scientific innovation and vice versa. The same day, after the lunch break, a panel on US National Intelligence and Neuroscience, then Zack Lynch, founder of Neurotechnology Industry Organization a venture capital firm investing in human performance technology was invited to discuss potential avenues in the neuroscience business. As the event we were at was an annual meeting on neuroethics, Lynch's presence as financial specialist for potential start-up in neurotechnology felt strange to me but did not seem to offend other participants. I soon began to realize that participants were mainly neuroscientists, cognitive neuroscientists, neurologists, medical doctors, psychiatrists, neuroethics lawyers, and business people.

Hence, the diversity I had first perceived was not confirmed. Instead, what I came to understand was that the large majority of participants were medical scientists and bioethicists. As I was gaining a better understanding of INS's mission and membership, I decided to attend the 2013 Annual Meeting in San Diego to present a poster on philosophical concerns regarding the neuro-turn in education. I anticipated being at odds with the overall atmosphere, and I certainly was. However, my reason for attending was less about the poster presentation or any academic ambitions and far more because I needed to see the authors behind the papers I was reading on neuroethics - the people behind the ideas. I was also trying to understand what ethical theory was the foundational ground for the emergent field of neuroethics.

During the 2013 Annual Meeting, I had the opportunity to meet the neurophilosopher Patricia Churchland, who presented a lecture on her book *Braintrust: What Neuroscience Tells Us About Morality* (2011). Her work roots our moral values in an impulse common to all mammals: the caring for our offspring. Referring to oxytocin blood levels to indicate caring behaviours in humans, Churchland insisted on the importance of understanding that our most cherished values are fundamentally based on hormone fluctuations. In response to critics who described her argument as part of her on going work as an eliminative materialist, she was going to publish two years later *Touching a Nerve: Our Brains, Our Selves* (2013), in which she explained that accepting that our brains are the basis of who we are can give hope that we can fix malfunctions

and, in the case of problems we cannot yet fix, we can be more understanding and compassionate.

I started to feel, when facing arguments running along those line—that my brain is the basis of who I are—that it always carry the idea that we, human, can be fine-tuned to fit some obscure definition of normality. I am not contesting the biological framing here but the call for a normative definition of human being – the implicit critic of diversity in the realm of biological being. One thing this notion seems to share with the ideas of other presenters I was going to meet, is an implicit need to control, adjust, optimize human for different purposes: moral neurobioenhancement, cognitive enhancement for military or business applications, and so on. Such views within the field of neuroethics became associated with three distinct sub-groups at the 2016 Annual meeting of the International Neuroethics Society:

Since its beginning neuroethics has been a pluralistic, multidisciplinary discipline that brought together people from diverse fields examining both theoretical and practical issues pertaining to the neurosciences. Within the discipline, however, we can identify three different perspectives or “identities”: first, there is the empirical perspective according to which neuroscience is given an important role in informing (and perhaps revising) our attitudes towards agency and responsibility; second, there is the speculative perspective which sees a brighter line between theoretical and practical issues, and between the humanistic and scientific; third, the pragmatic perspective looks at the way that neuroethics can be both instrumental and informed by theoretical considerations. (International Neuroethics Society, Meeting Program, 2016)

Here, I question the affirmation that neuroethics is a “discipline that brought together people from diverse fields,” since every member of INS has a foot in clinical neuroscience. The few philosophers with a presence in the field the year I was there were Churchland, coming from an empirical perspective, and Savulescu, applying a speculative perspective to ethical questioning. Elaborated primarily by author Eric Racine, a bioethicist from Montréal’s Institut de recherches cliniques (IRCM) the pragmatic perspective was also presented in a short session. I will explore his work in more detail in section 3.4, since it was the closest I got to find safety i.e foundational elaboration within the field. His book *Pragmatic Neuroethics: Improving Treatment and Understanding of the Mind-Brain* (2010), is a ground-breaking work for positioning neuroethics in a pragmatic mode of moral enquiry, one with a moderate naturalistic

epistemology. Although the idiomatic use of the term *pragmatism* risks oversimplifying his perspective, his main argument rests on the importance of maintaining deliberative democratic processes regarding practical issues; the rapid development of neurobiotechnologies raise many questions about which we should collectively decide on what to do:

From an ethical and pragmatic stand point, there are broad implications of some neurotechnologies, such as neurostimulation, neuropharmacology, and neuroimaging. Given such broad implications, it is clear that communication and public discourse must also broaden to include the perspectives and experiences of all those concerned by the implications and consequences of neuroscience advances. (Racine, 2010, p.216)

From this initial statement, not only did neuroethics evolved into three “identities,” it also has maintained from the start an uneasy double objective: to address issues brought about by neurotechnologies and to define the neurological bases of human ethics. These competing objectives make it difficult to focus on the ethics of applying neurotechnologies without including the paradigm sustaining the neuroscience of ethics. American philosopher Tom Buller (2005) articulated the risk of having neuroscience contribute to ethics, using clear examples that remind us of the distinction between facts and value. For instance, if neuroscience can identify the neurophysical correlate of an *out-of-control behavior* (fact), it cannot, by itself, be the basis of the evaluation (normative) of this *out-of-control behavior*:

The reason for this is that, in the absence of factors external to these neurophysical states, one neurophysical state is no better or worse than another—internal neurophysical states are logically value neutral. We deem serotonin levels to be excessive on the basis of normative notions of appropriate function that are informed by societal values. In the absence of these notions why would the level of serotonin be relevant? (Buller, 2006, p.63)

Having a neuroscientific perspective determine normative ethics is problematic. We need to be free from technological imperatives if we are to discuss the pros and cons of technological development. My impression of the field is that there is a constant urgency, some technological imperative that draws attention away from fundamental questions.

We are submerged daily by examples of this lack of fundamental questioning. Again this morning in the news, like most days, articles claiming to have identified the benefit of dancing and playing music on cognitive function. Then invariably, follow dubious correlation and extrapolation: studies extending claims far outside ethical limits by suggesting that this new knowledge of the brain would be beneficial in classroom. Such claims are bound to create false expectation. Aren't these claims plain lies? Again, same paper, same morning, another study stating that post-traumatic syndrome (PTS) is associated with neurological injuries by opposition with the current status of PTS as psychological states. How can this affirmation make news: Are we still thinking that psychological states are disembodied, happening outside our body to make news with the affirmation that PTS leaves neurological trace – a dualistic positioning that those not simplify the mediatisation of neuroscientific information. More generally, the diffusion of scientific results in the media, with the latter's constant push to create expectations beyond the facts and uncritical analysis of context, is one of the issues neuroethicists are addressing. For Judith Illes, UBC Professor of Neurology and Canada Research Chair in Neuroethics, this is an urgent matter. To determine how the training of neuroscientists could improve their ability to communicate results in a more balanced way, she brought together media specialists, bioethicists, scientific communicators, and editors of scientific journals to establish guidelines. Aiming to achieve a cultural shift, the authors “urge funders of neuroscience research to encourage or even require information on plans for knowledge translation, public engagement and outreach”(Illes, 2010, p.66):

Specialized training of journalists, editors and neuroscientists is needed to promote effective communication of important neuroscience findings and considerations of their ethical, social and policy impact. . . . They could become neuroscience “knowledge brokers” by linking the creators of new knowledge with recipients, and could increase the quantity and calibre of communications activity by providing education about and access to new knowledge. . . . The community of scientists and scholars with interests in neuroethics—a mixed composition of experts in neuroscience, social science, law and philosophy whose multidisciplinary interests lie at the intersection of neuroscience and its impact on people and society—offer a compelling starting point for advancing communication in neuroscience. (Illes et al., 2010, p.66)

Certainly, much could be gained by having neuroscientists become better at communicating their results, but will the framework sustaining the neuro-turn get more critical attention? Are we considering the possibility that scientific research is a social construct? Narrowly addressing questions related to the dissemination of information and the need for educators of an education about neuroscience does not necessarily reframe the positioning of the *scientific expert* in societal debates: information sharing is only one part of the debate, and neuroethical questioning should include equal consideration of the multiplicity of influences that shape society. I question the fact the by definition, multidisciplinary effort imply drawing on knowledge from different disciplines without anyone really leaving the comfort of their own discipline

The influence and impact of neurosciences in education has sometimes been attributed to miscommunication from neuroscientists, as discussed here, but there are also voices calling for the training of neuro-educators. This approach would require that teacher training programs include at least a rudimentary introduction and critical analysis of cases of neuromyths, or common misunderstandings about neuroscience—for example, that brain differences are genetic and immutable, that neurotransmitter systems and psychological functions have a one-to-one relationship enabling selective targeting of functions, or that brain images are more “objective” than behavioural measures. This is certainly a defensible argument but very much at risk of being superficially approached, superficially in the sense that such training might not start with a repositioning of scientific knowledge as socially constructed.

The way we are experiencing and enacting our human condition cannot be reduced to disjointed elements of knowledge, for we are experiencing the neuro-turn as human beings, not machines. In education, the impact of the neuro-turn has generated questions beyond the metaphor of the mind as a machine. Some educators have been particularly sensitive to false claims as they are exposed to the pressure for performance and exposed to the discourse promoting scientifically proven pedagogy. Massive financial resources have been diverted from the classroom and invested in dubious Brain Gym-related merchandising, those softwares suggesting daily online games and puzzles. What is the extent of this problematic in the school systems of the Western world? Here is one example of a phenomenon occurring around the world:

The case of Scientific Learning's flagship product, Fast ForWord is far from been unique. According to the company, "Based on more than 30 years of neuroscience and cognitive research, the Fast ForWord® family of products provides struggling readers with 18 computer-delivered exercises that build the cognitive skills required to read and learn effectively". In 2009 the Johns Hopkins University School of Education's reviewed the evidence on the benefits of this product for struggling readers. They found little evidence available from appropriately designed studies. Furthermore, what evidence there was indicated that Fast ForWord® was of no value in improving the reading ability of struggling readers. Nevertheless, according to a recent press release, the company's third quarter revenue 2009 was \$19–20 million from sales to schools around the world. (Farah, 2011, p.775)

If we consider how much education is already underfunded in neoliberal economies, such decisions made within school systems have a direct impact on students as they over amplify mechanistic views of human being. As those commercial practices can easily be described as unethical business, does it required to be address as a neuroethical issue or would other type of applied ethics just as helpful in engaging the problem?

This is what I was out trying to understand. I was looking for a dialogue across and beyond discipline, even wondering where transdisciplinarity could come to help open new pathways in ethical decision-making. It was important for me to look past the issue afflicting most discussions of neuroethics and technologies, namely that ethical considerations are viewed as lagging behind technological development. I was looking for a discursive place where all stakeholders caught-up in the neuro-turn could sit at the same table and learn from the past to move forward.

The first collective effort that gave shape to the field of neuroethics can be linked to a 2002 conference in San Francisco called "Neuroethics: Mapping the Field" (Giordano 2010; Illes & Bird 2006; Marcus 2002), which coincided with an increasing interest in the potential for and challenges in developing neurotechnologies in a multitude of disciplines. The group of neuroscientists present at the time are still there today, forming the core think-tank in the field. In rapid succession, two journals (*Neuroethics* and the *American Journal of Bioethics—Neuroscience*) were founded, along with The International Neuroethics Society (INS) in 2006. Neuroethics fully entered academia (Fukushi & Sakura, 2006; Levy, 2008; Marcus, 2002; Roskies, 2002) to give a

name to the “field of philosophy that discusses the rights and wrongs of the treatment of, or enhancement of, the human brain.” More generally, neuroethics is a discipline that aligns the exploration and discovery of neurobiological knowledge with human value systems (Illes, 2006a). It was considered from the start to be a sub-discipline of bioethics, the branch of ethics that studies moral values in the biomedical sciences.

Van Rensselaer Potter, an American biochemist introduced the term bioethics in the 1970s as an attempt to promote the integration of biology, medicine and human values (Jonsen, 2003). The notion of human dignity and also ethical issues in non-human being were explore in the context of secular society in the Western world. Mostly it is concerned with ethical problems arising from biological research and its applications in such fields as organ transplantation, genetic engineering, and human reproduction.

Bioethics became an autonomous, distinct field of scholarship and practice that would take into account knowledge of the natural world and that would yield a new form of wisdom to ensure the survival of the human species in face of threats, real or anticipated. The central innovation was to focus on establishing and sustaining channels of communication between the two cultures - sciences and the humanities:

. . . to contribute to the future of the human species by promoting the formation of a new discipline, the discipline of Bioethics. If there are “two cultures” that seem unable to speak to each other—science and the humanities—and if this is part of the reason that the future seems in doubt, then possibly, we might build a “bridge to the future” by building the discipline of Bioethics as a bridge between two cultures. (Potter, 1971, p. VII-VIII)

Bioethics was and is still today aiming at bridging human values and scientific development, expending into different sub-discipline: animal ethics and environmental ethics In that respect, neuroethics is establishing itself as another sub-field of bioethics recognizing new ethical issues that some considered as not addressed adequately either in bioethics. In other words, the justification of establishing a neuro-ethics could originate from the need to establish normative framework to new issues brought about by neurotechnologies. Again here on the objective of this normative inquiry:

The normative inquiry that my team at Stanford and I undertake in neuroethics is neither intended to establish definitively what ought to be

done nor to provide a single view of best alternatives to difficult ethical, legal, social, and policy challenges in neuroscience. Rather, we work with the goal of achieving a pragmatic starting point for identification of issues and discussion of scenarios of importance, and resolving them through a negotiated scientific-social process. We seek logical and flexible guidance to the task, and one that empowers, not encumbers the scientific process. (Illes, 2006a, p.2)

This focus on *not encumbering the scientific process*, I think, set the tone for what was going to follow. In my view, neuroethics only went so far towards integrating science and the humanities, and rapidly took a turn toward biomedical ethics.

The word neuroethics first appear in the work of Patricia Churchland, the analytical philosopher of neuroscience mentioned above, in her 1991 article “Our Brains, Our Selves: Reflexions on Neuroethical Questions.” The word neuroethics was going to frame the neuroscience of ethics:

It might be expected that a philosopher should have a position on the question of where moral standards come from, i.e., a moral theory, and that the theory would be defended rigorously and vigorously to the hilt. . . . If I do not have a moral theory, how can I presume to go on and talk about morality in the application of neuroscientific knowledge? I shall do it the way we all do it when we are not self-consciously practicing moral philosophy: we reason together, with tolerance, patience, sympathy and common sense. We draw on such wisdom and empirical knowledge as we may be lucky enough to possess, and we engage in give-and-take. (Churchland, 1991, pp.79-79)

If “we reason together, with tolerance, patience, sympathy and common sense” equates to pragmatism, her suggestion that we draw on empirical knowledge raise the question: What empirical knowledge are we seeking here? Is this knowledge itself or the way it was constructed value neutral, or is it the result of massive economic power plays? The little I know about how Latour actor-network theory describes the work of scientists within our society leaves me with the understanding that empirical knowledge is value-laden in every direction. If I find that part worrisome, my worry increases when I read “we engage in give-and-take.” From what I learned in my short time as a member of INS, attending conferences and reading publications by authors who had empirical, speculative, or pragmatic perspectives, there is no such thing as “give-and-take” in the

forces at play, for the neuro-turn is feeding on scientific inquiry teaming up with economic interests.

Churchland conceives justice and fairness as having some basis in our evolutionary history; she views morality as having a material basis. It is difficult to go against such view without leaning unto dualism, I still want to express concern in face if reductive approaches. The moral landscape she describes is part of the neuroscience of ethics and before going any further, it is important to clarify fundamental distinction between these two main branches of neuroethics (Levy, 2008). The ethics of neuroscience seeks to develop an ethical framework for the conduct of neuroscientific enquiry and for the application of neuroscientific knowledge to human beings. The neuroscience of ethics embraces the growing findings about the neural basis of moral agency (Green et al., 2004). This neural basis comes from fMRI studies showing that ethical decision-making mobilizes very distinct parts of the brain:

there are multiple, partially separable neuro-cognitive architectures that mediate specific aspects of morality: social convention, care-based morality, disgust-based morality and fairness/justice. Second, that all aspects of morality, including social convention, involve affect. Third, that the neural system particularly important for social convention, given its role in mediating anger and responding to angry expressions, is ventrolateral prefrontal cortex. Fourth, that the neural systems particularly important for care-based morality are the amygdala and medial orbital frontal cortex. Fifth, that while Theory of Mind is not a prerequisite for the development of affect-based automatic moral attitudes; it is critically involved in many aspects of moral reasoning. (Blair et al., 2006, p.13)

This knowledge, this neurobiology of ethics does not provide an answer to how to proceed in society when confronted with ethical issues and with trying to define what is a good life for self with others? The question remains of what we will choose to care for, to value. Neuroethics, by its double focus, is constantly presenting a double message. On the one hand, it is a pragmatic and welcoming discursive place, open to all stakeholders and positioning itself in the complexity of societal interactions. On the other hand, it is presenting itself as a somewhat reductionist and speculative enterprise. It might very well be standing with one foot in humanism and the other in transhumanism.

3.2. Current focuses in neuroethics

Advances generated by the recent interest in neuroethics have evolved along the following axes (Farah, 2011):

- Neuroimaging and research design in educational neuroscience (issues of consent, confidentiality, stigmatization, and incidental findings)
- Cognitive enhancement/neurotechnology, nootropics, brain-interface machine (issues of fairness, selfhood)
- Ownership and control of neurotechnology

More specifically, I will discuss the aspect I had a chance to observe up close in emergent studies in educational neuroscience (Lalancette & Campbell, 2012, Lalancette, 2012):

a. Neuroimaging and research design in educational neuroscience

Educational neuroscience involves research on human subjects, and some issues created by methodology collide with the fundamental ethical standards for human subjects that guide academic research. Certain questions arise that are specific to the neuroimaging methods already discussed, as well as obvious questions regarding some cases of “instant science” versus peer review: cases where fMRI images are made on very few subjects (fewer than five) with no description of the experimental design. I will consider some examples in more detail below.

Consent: surrogate decision-making

The fact that experiments are designed to gain generalizable knowledge that may benefit others in the future, but not necessarily the participants themselves, taints the basis for surrogate decision-making in educational neuroscience research. The parents are required to use the best interest of the child as the basis for their decision-making. What is the risk that the parents may have misconceptions about non-therapeutic research investigating cognitive functions? Even if applications of general knowledge can be further used to assess the effectiveness of educational interventions

(e.g., for dyslexia), parent education regarding the aims of research remains an important consideration to be dealt with as part of informed consent.

Confidentiality/Privacy

When using neuroimaging in educational research, personal information about the child may be required either to ensure the safety of the participant or to meet some predetermined exclusion criteria. What will happen if schools have an interest in the results?

There is also concern about the fact that neuroimaging is starting to reveal a degree of personal information regarding certain patterns that are decoded as embryonic steps towards thought reading. Electrical brain imaging yields a much different reading when the subject *recognizes* information than when he/she doesn't. In other words, if I am the subject of such a study, and questions are asked for which I know the answers but I don't wish to respond, the results, in term of electrical patterns, will show that I knew the answers. To some extent, this borders on thought reading, albeit with respect to very specific questions (Kennedy, 2004).

Stigmatization

Neuroimaging studies sometimes use value-laden language to describe various brain structures and functions, even though normal brain anatomy and functions have yet to be determined. What if such "diagnostic" terminologies transfer pejoratively to educational practices? How do we honour the uniqueness of individuals beyond the normative construct of "normality"?

Incidental findings

Detecting an unexpected pathology is not limited to educational neuroscience research but is nonetheless a reality, quite apart from the risks related to Type I & II statistical errors (detecting an effect that is not present or failing to detect an effect that is present). Incidental findings present practical and ethical challenges to neuroimaging researchers, and very few guidelines currently exist

b. Cognitive enhancement/neurotechnology_nootrops_brain-interface machine

Determining safety is crucial to the assessment of the ethical implications of neurotechnologies. Although clinical trials have methodologies for assessing risk and risk/benefit ratios, they do not yet exist for the non-medical application of neurotechnologies. As argued by Farah (2005), compared to drugs taken for therapeutic purpose, side effects of enhancement drugs are less acceptable, and it seems unrealistic or simply naïve to assume that the person taking them is adequately informed about the risks, since that perspective doesn't take into account societal pressures to use these substances.

c. Ownership and Control of Neurotechnology

It is less than clear who will decide the direction taken by research and development in neurotechnology. Who will determine priorities? Who will choose the modes of distribution? The answers largely depend upon who will own these technologies. In the case of nootropics, their development occurred within medical or neuroscientific pathways. In most cases, when a technology expands from those pathways, it becomes privately owned, which greatly lessens the opportunity for proper evaluation of the technology or the diffusion of reliable information.

Over and above these specific questions remains the worry that neuroscience might be telling us we are really no more than physical objects, albeit very complex ones containing powerful computational networks. Why then should the fate of these objects containing human brains matter? Neuroscience and the application of neurotechnologies raise questions of the person-object distinction that plays an important role in morality. First, we view persons as having agency and therefore generally hold them responsible for their actions. We do not say, "His brain made him do it!" However, as the neuroscience of decision-making and impulse control begins to offer an array of neurotechnologies, the deterministic viewpoint will probably gain a stronger hold.

Such ethical challenges are currently located within the subdiscipline of neuroethics. Why a subdiscipline? If it is obvious that a subdiscipline makes it easier to regroup disciplinary specialists under a particular label, does doing so offer an optimal

platform for all stakeholders to express their concerns? In the case of educational neuroscience, some have suggested establishing a sub-sub-discipline, along the lines of educational neuroethics. This would create such a specialized and narrow field – both for ethics and for education – that it would be difficult to keep a global understanding of neither one of those domains of inquiry.

The need for a *neuro*-ethics and the risk attached to the emergence of sub-disciplines in applied ethics is sometime described as a case of “reinventing the wheel,” distracting the different stakeholders from a literature produced from past inquiries into similar issues/questions, which may be rich and diverse. Some critics are very vocal:

We need to resist the temptation to categorize all ethical questions by domains of inquiry. Bioethicists claim to reject reductionist perspectives, and yet have been caught up in it in the genetic and now, neuro contexts. We now need to be wise enough to learn how to share this intellectual wealth, and encourage researchers to do so. (Alpert, 2008, p.66)

Critics of the relevance of sub-disciplines in the broader philosophical field of ethics articulate two main concerns. First, there is the above-described risk that such sub-disciplines could be nothing but distractions that obscure rather than clarify the analysis of pressing ethical issues (Parens & Johnston, 2007; Whitehouse, 2011). Secondly, there is the risk of inflating the perceptions of the dangers of applying new knowledge, something that could slow progress (Wilfond & Ravitsky, 2005). Neuroethicists argue that traditional bioethical approaches cannot be applied in the face of the epistemological and cultural complexities of neuroscientific research, as demonstrated by Roskies (Roskies, 2006).

Another concern is that the recent emergence of neuroethics carries a risk of uncritical engagement by neuroethicists regarding their own practices and the funding sources that might shape their agendas. Maintaining a critical position would prevent neuroethics from becoming self-promoting and would help practitioners keep in mind their role to monitor the application of neuroscientific findings (Brosnan, 2011). De Vries, in *Who Will Guard the Guardians of Neuroscience* (De Vries, 2007) has raised concerns over the funds supporting neuroethicists’ work, most of which has come from the Dana Foundation, an agency explicitly promoting brain science. The International Neuroethics

Society is made possible by funding from a very prominent Big Pharma company. I questioned the organization about this and was told that it was not a problem, that the company did not influence the society's agenda, and that it was better than no funding at all. I was profoundly troubled by the certainty of this statement and did wonder why expensive meetings in exotic destinations were required at all considering the fact that collusion between neurotechnologies patent holders and promoters was already an intrinsic ethical issue in the field.

I think the question of the role of sub-disciplines is important to consider. Does a sub-discipline of applied ethics help me when I am faced with an ethical question? Is it justifiable to systematically screen children for a specific neural marker for dyslexia, knowing that this screening could lead to incidental findings and that we would have to decide what to share with or withhold from parents? Helpful ethical proposition without going looking into a sub-discipline? Many sociologists considering the question of the self-promotion of neuroscience via neuroethics denounce such a sub-discipline as so narrow that it even presupposes Western value-systems to be universal and focuses on the individual rather than on social systems (Bosk 1999; De Vries 2004; Fox & Swazey 2010; Keirns et al., 2009). They certainly have a point regarding pre-supposed cultural context for neuroethics but considering that this Western value-systems did go global, it might not be the main restriction to the scope of neuroethical inquiry. The medicalization of human life defines and the ties of neuroethics within bioethics seem to also be narrowing the scope.

The main risk described in these studies is that neuroethicists, when working from an uncritical framework, may create expectations about technological potentials or dangers and, by doing so, may influence whether or not some technologies will be adopted or rejected. Sociologists argue that such expectations are much more than mere words, and are truly performative acts (Hedgecoe, 2010). For Hedgecoe, the rise of neuroethics is aligning itself with neuroscientific views of the future and by doing so, is exposing itself to the strongest sociological critiques previously addressed to bioethics, although one of the major aims of neuroethics has been to justify its clear separation from bioethics. How so? First of all, neuroethics often justifies its disciplinary independence via the assumption that the brain is the most powerful driver of behaviour

and by affirming that “the brain’s relationship to the mind is a key way in which neuroethics is differentiated from bioethics” (Brosnan, 2011, p.290). By doing so, neuroethics can be viewed as particularly active in promoting a reductionist conception of self and mind in which neuroethics overstates neuroscientific findings. Secondly, neuroethics distinguishes itself from bioethics by assigning itself a special double role: it concerns itself not only with the ethical study of neuroscience, but also with the neuroscientific study of ethics, work within neuroscience, cognitive science, and psychology that attempts to understand the neurological basis of moral reasoning. Other depictions of neuroethics’ role include these, which emphasize the first (Farah & Wolpe, 2004) or second branch (Gazzaniga, 2005) or describe a continuum between the two (Illes 2006b; Racine & Illes 2008). Part of the issue of neuroethics’ double identity, as science and as ethics, has implications for its role as a moral regulator of neuroscience, if that is indeed the role it wants to take. Although the motives are clearly stated, this does raise the question of where an applied ethics such as neuroethics stands in relation to ethical theories (Allhoff, 2011). The mission statement of the International Neuroethics Society is indicative of this paradox:

Our mission is **to promote the development** and **responsible application** of neuroscience through interdisciplinary and international research, education, outreach and public engagement for the benefit of people of all nations, ethnicities, and cultures. (International Neuroethics Society website)

I think that *promote* and *responsible application* are at odds in the same sentence. How to reflect on and articulate what ethical propositions would better help us in steering through the neuro-turn is the object of the next section. I agree with critics on the limits of sub-disciplines, on the risk they present of bringing an intrinsic overspecialisation of concerns that could benefit from wide encompassing ethical proposition.

3.3. On the limits of pragmatism

The first decade of the 21st century saw an accelerated trend back to pragmatism, so it was to be expected that neuroethics would develop within this framework. Eric Racine has been instrumental in defining the foundational ground of

neuroethics, arguing for pragmatic naturalism. He navigated away from restrictive usage of the word pragmatism - often viewed as being simply a direct line to assesses the truth of theories in terms of the success of their practical application - to a more elaborate recognition of the role knowledge plays in human experience. Knowledge, in pragmatic ethical decision-making is viewed as what we need to know in order to gain further understanding to make informed decisions.

Something about the view of pragmatic naturalism as a tool to clarify and offer applied solutions to ethical problems occurring in the application of neuroscience to health, law, and cognition was not straightforward to me, and so I took my questions to Eric Racine's office in Montréal. He patiently listened to my concern that pragmatism might not be sufficient to prevent potential landslide from personhood to brainhood. If pragmatism is tied to practical success, how can it be a foundational ground for neuroethics? How can pragmatism answer the forward push of transhumanism? Racine pointed out that by bringing all stakeholders to the table to reach a decision, one can be confident that political and economic interests will not override the interdisciplinary work of neuroethics. Still, I was puzzled. First, how does one make certain that *all* the stakeholders are making their voice heard? I needed to revisit the roots of pragmatism before attempting to answer that question.

It appears that from its start, there never was one pragmatism, no program around which all pragmatists united, although some of the themes are recurrent. The American philosopher F Thomas Burke (2013) point at the fact that this flexibility within pragmatism does not entails ethical emptiness or an absence of moral guidance: 'moral judgment requires an objective sense of history and interpretative skills oriented to humble but alert appreciation of the fact that past and current circumstances as well as long-term future consequences of our actions propagate well beyond what we are able to discern by present lights' (Burke, 2013, p.159). The two recurrent commitments that pragmatists tend to share and that are highly relevant here are to the fact that standards of objectivity are historically connected and that it is important to connect philosophical concepts to the practices of everyday life (Burke, 2013, p.2). For some pragmatists, ethical questions can be resolved by drawing upon the resources offered by our practices in reference to the consequences they have for our lives. But it goes further

than the practical. The first generation of American pragmatists reconceived how cognition works; from that perspective, they were the first cognitive scientists. Charles Peirce, William James, John Dewey, and George Mead, considered classic pragmatists in their recognition of the lived experience, are relevant here. They denied that cognition consists of internal representations about static external matters manipulated rationally within a Cartesian theater. Pragmatism originally would have denied thinking in terms of the mechanization of mind or to follow along transhumanist thought experiment since central to its essence is the lived experience.

Maybe my concern should not have been so much about making certain all the voices are part of the ethical decision-making process but that the decisions validate the lived experience as a central element. Or should I say as a central “value”? This would mean, then, that I’m carefully approaching consideration in normative ethics but at the same time don’t really want to explore the theoretical frameworks within which moral judgments of right and wrong take place, although these often play the role of unspoken assumptions in the analysis of neuroethical issues. I’m really hoping to move beyond the right-or-wrong conundrum.

In recent decades, philosophers have been struggling to explain, not only to society at large but also to fellow academics, what they do. What is their role? If some argue that moral philosophers are better suited to providing competent assessments and detecting fallacies, this implies that moral concepts have a special nature that the experts understand better than the non-experts, or that moral arguments have a special logic that only those with philosophical training are able to grasp (Rorty, 2009). That would be a very sad conclusion. This view in fact reflects the influence of Kant’s moral philosophy wherein, like other thinkers of the Enlightenment wanting to shift to a democratic doctrine, every human being had inner resources or an inner moral law to make sound moral decisions. In the case of Kant, the requirement of an unconditional principal, the Categorical Imperative, produced by pure practical reason, was viewed as being entirely unaffected by historical experience.

Anscombe (1958), in her paper *Modern Moral Philosophy* identified the most important change produced by secularism as the shift from thinking of morality as a

matter of unconditional prohibitions to seeing it as an attempt to work out compromises between competing human needs. Moral philosophy, which is the most visible of the various philosophical specialities (Rorty, 2009), is one field of philosophy very much involved in public debates, because it is concerned with issues that are directly affecting people's lives: mind–body theoretical debates are not as tangible as issues surrounding stem cells, abortion, or neuropharmacology. Should I not then drop the idea that moral philosophers have a duty to provide us with moral principles that are completely context-free? Certainly, for I think our moral principles emerge from our encounters with our surroundings, just as do hypotheses about physical phenomena, or poems.

Our senses of who we are and what is worth dying for are linked in that context to cultural and historical contexts. I have just finished saying this and still, I find myself thinking that there ought to be people who can show me right from wrong. Annoying. Rorty (2009) argues that there is a permanent tension in the Western world between the morality of the Enlightenment and the exclusionary moralities of culture and population that have not enjoyed the security and wealth we have, having missed out on the emergence of tolerance, pluralism, and democracy. So in fear of a so-called relativism, there is still ample audience for definitions of morality that would originate from a special source and that would have a special relation to something neither contingent nor historically situated. A society only questions its moral foundation when two or more alternatives are under consideration. That is why the question almost never arises in traditional societies, but the question is arising all the time in modern pluralistic societies.

If I take a consequentialist approach to neurotechnology, I have to identify what I am trying to maximize by investing in those technologies: is it people's welfare, happiness, and pleasure? Or am I a utilitarian, seeking to benefit as many people as possible? Consequentialism, I found, is intriguing for its constant need to define the scope of the moral decision, the knowledge at the time, and the fact that there might be things we don't know but will learn about later that could change what we consider to be moral in providing the most good to the largest amount of people. Or is it possible to narrow this approach to human being without including other species, without giving equal consideration to the interest of all beings? For example, if you have to kill 1,000 chimpanzees to find a cure for memory loss in Alzheimer's disease, would you do it

using utilitarian arguments? Such decisions can't be reduced to simple calculation since utilitarianism extends further than an attempt to 'maximize happiness or promote the greatest happiness of the greatest number' (Barrow, 2015, p.21) but a moral standpoint closely related to social justice where happiness is not a commodity but an ethical ideal. In response to the question of animal testing raised above, the deliberation would need to include one of the challenging aspects of consequentialism which is the difficulty in knowing where to stop the circle of people. For Peter Singer (2011), a contemporary philosopher and utilitarian, the most important ethical issues are those that confront us daily, such as the question of whether or not to use human enhancement technology. The ontology of his utilitarian argumentation rests on his definition of human beings as social animals, a definition totally at odds with Rousseau's fantasy of isolation as the natural condition of human existence, rejecting at the same time his account of the origin of ethics from the school of social contract theorists. For Singer, the social contract might have made sense two hundred years ago to come against the orthodoxy of the time that based morality on a divine lawgiver. But since we know more now about the biological basis of all social behaviour and that we have lived in groups longer than we have been rational human beings, the development of some degree of restraint towards other members of the group—kin altruism, reciprocal altruism, and group altruism—could very well have been the beginning of a social ethics. What would be, in that context, the source of right and wrong but our responsibility to others to escape the human versus non-human dichotomy? I will further discuss Levinas ethics of responsibility to others in Chapter 4 as I propose integrating alterity, this capacity to include otherness in moral deliberation as a way to address complex ethical questions today.

Trying to free our moral deliberation from using disembodied concepts of right or wrong could be seen as full embrace of a naturalistic view of ethics and bring back the question of what neuroscience can tell us about our morality? As Singer recognized, the one step further we have to make after understanding the evolutionary component of our moral reasoning is that although we might witness elements of reciprocity—for example, in human and non-human animals—we have the unique capability to think and reflect on our moral behaviour. It follows that even if science can tell us about the origin of our moral behaviour, it does not tell us what we ought to do. Science might very well tell us that these instinctive behaviours that have evolved might not be the best kind of

behaviours in the particular circumstances in which we live. For example, if greed helped us survive and innovate, there is also a point where it becomes pointless and pathological.

From my understanding, Singer also shares the views of Richard Rorty in understanding moral choices as situated in one's social context, driven not by moral "relativism" but by a deep sense of social justice away from the right or wrong, from utilitarianism to a form of pragmatic, naturalized ethics. Darwinian thinking heavily influenced the epistemology of the early pragmatists. Rorty conveyed the important distinction between the pragmatic perspective and relativism:

In much of the onto-theological tradition, the lower-higher distinction is constructed as a distinction between the part that is content with finitude and the part that yearns for the infinite. . . . the struggle between relativism and fundamentalism is between two great products of the human imagination. It is not a contest between a view that corresponds to reality and one that does not. It is between two visionary poems. One offers a vision of vertical ascent toward something greater than the merely human; the other offers a vision of horizontal progress toward a planet-wide cooperative commonwealth. (Rorty, 2011, p.17)

Situating pragmatist's work towards ethical consensus as an horizontal progress, Rorty departs from disembodied ethical framework and in that respect echoes Singer in what he calls "enlarging the circle of the "we," enlarging the number of people whom we think of as "one of us," those about whom we are concerned, is the only way to make moral progress. How would this guide my moral deliberation on the decision of using nootropics at school? Considering that fair access to nootropics cannot be achieved, it might be unethical for utilitarian on the grounds of distributive justice, but ethical on the grounds of potential increase of happiness. What is missing here is how these moral theories define what it means to be human and what a better quality of life stands for. What would be the deontologist position, where moral choices are made based on the personal respect and fulfillment of values chosen by oneself, finding yourself responsible for fulfilling those values you have imposed on yourself? These values would be expected to be the same as those of the person next to me because we're both human beings, the only species able to submit their will to their principle, in other words, to act morally, giving each human being an infinite worth that excludes the calculation involved in utilities about the

relative value of one individual in face of a larger group. In deontological ethics, there is no possible trade-off, since every human being represents infinite worth: Five persons having infinite worth is equal to a hundred persons having infinite worth and the action itself carry a moral value, regardless of the consequences of the action. For deontologists, the fact that we can find contingency in the writing of most cultures and bring it down to universal laws or categorical imperative is a confirmation of the structure of moral thinking in humans. What might seem as less demanding than consequentialism in making moral decisions is not necessarily that simple. The moral obligation not to kill becomes a struggle for deontologists faced, for example, with having to decide between killing five persons to save a hundred. As I often heard neuroethicists ask what it was that we 'ought to do', it seems that to frame the question that way would lead into a dead end as far as ethical decision making.

Here, it is interesting to see that in the face of my question making use of cognitive enhancement in schools, the deontologist's position on right and wrong on this topic have been used by group having opposed views in the following way: Instead of working at establishing an ethical consensus by enlarging the circle of "we," deontologists either refuse to consider human enhancement, with a "you shall not," or embrace it full throttle with a "you must, it is your duty" to enhance. People have *dignity*, meaning a special kind of intrinsic value that surpasses the value of any use to which they could be put. This categorical distinction is difficult to maintain if everything about persons arises from physical mechanisms. Those two main systems of normative ethical thought were laid down before Darwin published, in 1859, his *Origin of Species*, and I find it fascinating to see that many ethical philosophers have continued to work in the groove laid down by Kant and Mill:

The choice between deontological transcendentalism and utilitarian empiricism will be the coming century's version of the struggle for men's souls. Moral reasoning will either remain centered in idioms of theology and philosophy, where it is now, or will shift towards science-based material analysis. (Wilson, 1998, p. 240)

In both utilitarianism and deontology, the person-object distinction plays an important role. We also view persons as having a special moral value, as distinct from all other objects in the universe. Persons deserve protection from harm just because they are

persons. Whereas we value objects for what they can do—a car because it transports us, a book because it contains information, a painting because it looks beautiful—the value of persons transcends their abilities, knowledge, or attractiveness.

So what moral theory is better conceived to address the outcome of neurotechnologies? Since we can no longer ignore the empirical research leading to the naturalization of human moral thinking, Johnson (2009) has proposed using the results of such research to assess the relevance of the two major moral theories currently framing ethical debates in the Western World. I will use his critical analysis in an attempt to answer this question. His argument runs like this: No theory of morality can be adequate if it is incompatible with our most reliable scientific understanding of how the mind works as well as extensive empirical work in psychology, linguistics, and philosophy that has provided an understanding of the structure and function of human concepts. For example, knowing about Damasio's work on establishing the central role of emotion in human valuation (Damasio, 1999), we then have good reasons for thinking that such a theory cannot be fully satisfactory or give insights into what comprises human well-being and how it can be enhanced. The key element in Johnson's argument resides in the description of how our concepts reveal a contextually dependent factor: Utilitarianism conceals a deep metaphorical content in the form of a moral accounting that determines what action would generate the greatest moral value. Could this be the origin of our society's pervasive metaphorical understanding of well-being as wealth? A deontological aprioristic moral framework for its part, claiming that moral laws issue directly from an alleged pure practical reason that has nothing to do with emotions, is de facto untenable today, neuroscience, cognitive science and psychology having demonstrated that without emotions, any rational deliberations are ungrounded, which leaves reason in limbo.

The dominant paradigm within philosophical ethics was a form of anti-naturalism mainly supported by a strong "is" and "ought" distinction (Racine, 2008), until the work of William James (1842–1910), Charles Sanders Peirce (1839–1914) and John Dewey (1859–1952). For Dewey (1922), our principles and values arise from the very situations that confront us with moral questioning. He viewed ethical inquiry as a form of engaged problem solving, the adequacy of which has to be tested in our ongoing experience,

leaving no room for absolute, context-independent, eternal moral values or principles for such reflective transformation. The radical part of Dewey's view is that moral reasoning is a type of embedded ethical problem solving that can only be critically evaluated by how well a certain course of action eventually leads to the growth of meaning, to constructive cooperative action, and to the opening up of broader, more sensitive, and more comprehensive perspectives (Johnson, 2009).

Some argue that neuroethics is an ethic of technology and that in that sense it disturbed the distinction between person and object. What is understood as an ethic of technology took shape in the 20th century and rapidly shifted from a vision of technology as instrumental in the sense that it bears intrinsic neutrality, the good or bad criteria being attributed to the users rather than the technology. Further, one could argue that the paramount position of technology in modern society is a symptom of something more fundamental, a disorientation that had been in the making for 25 centuries. Heidegger's (1966) *Discourse on thinking*, presents the argument that since we can't stop or control the progress of history, we should be more concerned with the human distress caused by the *technological understanding of being* rather than the destruction caused by specific technologies. What he was putting forward was that:

We can affirm the unavoidable use of technological devices and also deny them the right to dominate us...(Heidegger, 1966, p.54) the approaching tide of technological revolution in the atomic age could so captivate, bewitch, dazzle, and beguile man that calculative thinking may someday come to be accepted and practiced as *the only* way of thinking (Heidegger, 1966 p.56)

Recognizing the unavoidable use of technology lead to the challenging question of how to avoid defining ourselves in response to technological imperative and not the reverse? Dreyfus (1993), in his article *Heidegger on the Connection between Nihilism, Art, Technology and Politics* bring the following clarification: 'The danger, then, is not the destruction of nature or culture but certain totalizing kinds of practices - a leveling of our understanding of being. This threat is not a problem for which we must find a solution, but an ontological condition that require a transformation of our understanding of being.' When we step out of our *technological understanding of being*, we can see that what is most important in our life is not subject to efficient enhancement. Applied ethics, by its

attempt to deal with specific realms of human action to craft criteria for discussing issues that might arise within these realms, resonates closely with pragmatism's approaches. But is it sufficient to address the complexity of our neo-liberal society? Why not question, not only the status of scientific knowledge but also the medicalization of life (Illich, 1976) itself that we must have agreed on at some point considering where we stand today. In the midst of the neuro-turn, making ethical decisions may turn out to be very complex indeed. Our humanity carries psychological quality that may very well be where we are the most fragile: in the face of android robots joining our communities, we will start to like them since we will build them with human features. In front of a big eyes robot, we will feel empathic. That in itself is inherent to our caring nature: watching Atlas, a humanoid robot, 5 feet 9 and 180 pounds walking on snow as someone is pushing it to make it fall, I felt sorry for the robot. We will start to like them but they won't in return which will leave us exposed – in need of a renewed sense of what makes us human as parts of something larger, not apart.

Summary

Exploring emergent neuroethics taking shape as a subdiscipline of bioethics, itself a sub-subdiscipline of applied ethics, led me to reflect on the risks such subdivision would bring, specifically the risks of distracting and obscuring efforts to clarify pressing ethical issues. Understanding moral choices as situated in a social context that is driven by a deep sense of social justice generates the concern that a neuroscientific understanding of ethics may provide answers beyond the technological understanding of human beings. I found the pragmatic naturalism for neuroethics that some are proposing problematic, after witnessing the difficulty such positioning has had in the past 10 years when it comes to providing a discursive space to a large circle of *we*.

3.4. Postscript

Ice to write on snow . . . *I wrote the word snow* . . . somehow we can't escape the physicality of our being, of our thought, and maybe sometimes, from that recognition, one can be expected to feel stuck in a tight place. I wonder how tight it would feel to be inside an electronic circuit, inside a machine? It seems to me it would feel very tight - or maybe not, since I wouldn't feel a thing.

Poem 3. A Poet's Poem, B. Shaughnessy (2008)

If it takes me all day,
I will get the word *freshened* out of this poem.

I put it in the first line, then moved it to the second,
and now it won't come out.

It's stuck. I'm so frustrated,
so I went out to my little porch all covered in snow

and watched the icicles drip, as I smoked
a cigarette.

Finally I reached up and broke a big, clear spike
off the roof with my bare hand.

And used it to write a word in the snow.
I wrote the word *snow*.

I can't stand myself

Chapter 4.

Phenomenological being

Overview: In this chapter, I reclaim the richness of my embodied phenomenological being. Across an inside–out continuum from self to others, I explore intersubjectivity as resonance at both the philosophical and the organic levels.

4.1. I as we

Phenomenology offers detailed analyses of various aspects of consciousness, including perception, imagination, embodiment, memory, self-experience, temporality, etc. In offering such analyses, phenomenology addresses issues that are crucial for an understanding of the true complexity of consciousness and might even offer a conceptual framework for understanding the mind that is of considerably more value than some of the models currently in vogue in cognitive science.

(Zahavi, 2010, p. 4)

It is impossible to deny our sensory experience of the world but its extent and richness sometime elude us as survivor of Descartes's *Cogito ergo sum*. As I am becoming deaf, not from old age but from a hereditary condition that precipitates auditory nerve degeneration, I am reminded daily of my senses as windows into the world. It does have a medical name, but that is not important here. This hearing loss happened not overnight but slowly, first with little things disappearing from my days: beeping from a device, city noise, birds, leaves in the wind. In a classroom, I developed a habit of walking up close to the person who was talking to me, without knowing I was adapting to my hearing loss. In so many different ways, my life was transforming into a world with no sounds, but so progressive were the changes that I was not experiencing any feeling of loss. On the contrary, I was often struck by the richness of the view I was gaining on the world around me: looking at someone talk without the soundtrack brought about a new physiological language and sensibility to the other. Also unique was a peaceful attention to my inner train of thought when there was no noise but the rhythm of my heartbeat. I did not mind this renewed mode of interaction, this transformed sensorial experience of life, and if it had not been for the imperative of efficiency in my work as a

teacher, I do not think I would have gone for the technological fix, but I did. And with this upgrade to digital ears, I almost forgot how many changes and adaptations in my way of interacting with people had happened. Losing one sense transformed my experience of the world. One thing remains after getting “new ears,” and that is an emotional understanding of how I get to know others and how deep are the interconnections in the fabric of life.

This experience led me to look more deeply into the question of how we know others. Is social cognition perceptual or inferential? Do we understand others through analogy to ourselves? Does understanding of self and other employ the same cognitive mechanisms? The discussions surrounding the nature of social cognition focus on understanding our ability to attribute mental states to self and others. Baron-Cohen, Leslie, Frith (1985) and other developmental psychologists have put together copious evidence of the innateness of this capability, whereby around age four, children can successfully deploy concepts of belief, desire, and other mental states when explaining and predicting behaviour in others.

I was interested in how Zahavi and Gallagher (2008) were developing a link between phenomenology and the simulation theory of mind in order to go further in gaining a possible understanding of how we know others. Following the simulation theory of mind, my understanding of others could be rooted in my ability to project myself imaginatively into their situations. Does my understanding of others rely on conscious simulation routines? No phenomenologically explicit simulation can be demonstrated when doing first-person studies. However, in recent years a large amount of neuroscientific evidence has been amassed about sub-personal activation in the cases of mirror neurons and resonance systems, which in terms of the simulation theory of mind would point to more implicit simulation, inaccessible to phenomenological inquiry, since it is almost reflex-like. The work of neuroscientists Rizzolatti and Sinigaglia (2010) has pointed at exactly this possibility by showing that although the mirroring properties of brain circuits have been extensively studied, little can be applied to social cognition until we understand the potentially unique role of a specific part of our nervous system that seems to allow an individual to understand the actions of others from the inside, “giving the observer a first-person grasp of the motor goals and intentions of other individuals”:

Whenever we are looking at someone performing an action, besides the activation of various visual areas there is a concurrent activation of the motor circuits that are recruited when we ourselves perform the action . . . Our motor system becomes active as if we were executing the very same action that we are observing . . . Action observation implies action simulation. . . . Our motor system starts to covertly simulate the actions of the observed agent. (Gallese, 2001, pp. 37–38)

Although I'm definitively not looking for a neuroscientific model at this point, it is interesting to look at alternative interpretations of the neuroscientific data. The neural resonance process of simulation described above by Gallese as our means of getting to know others is challenged by Zahari's work: could that process of intersubjective *simulation* be in fact intersubjective *perception*? Based on a concept of perception as temporal and enactive—i.e., involving motor processes (Noe, 2004)—and on the fact that mirror neurons fire so rapidly after any visual stimulation, it becomes much more a question of semantics: yes, the perception of the other person's action automatically activates sub-personal processes in the same part of my nervous system that would be activated if I were engaged in a similar action, but it is not me doing it (simulation), it is the other person doing it to me. In this light, the activation of a resonance system gains a central role in social cognition. So, as I interact with the others, this experience appears to be imbedded in a fully interactive resonance. Even if this scientific description is not totally irreconcilable with the phenomenological experience of getting to know one another, it is still fundamentally different in the way it carries the idea of an “inner” world and an outer physical world that phenomenology does not recognize. I am in resonance with the other in one intertwined world.

Making sense of our senses and of our phenomenological experience of spatiotemporal continuity in response to lived interactions addresses the fact that the brain might processes an action before a person decides to act (Libet, 1999, p. 47). This idea was also addressed in Polanyi's concept of the tacit dimension of knowing, where “we know the first term only by relying on our awareness of it for attending to the second” (Polanyi, 1967, p. 10). His book *Personal Knowledge: Toward a Post-Critical Philosophy*, first published in 1958 and re-edited in 2015, was a complete rupture from the scientific absolutes of his time, and for that reason his work really caught my

attention. As I was myself struggling to make sense of my training as a scientist, I realized that the critics coming from within this worldview were particularly powerful:

As human beings, we must inevitably see the universe from a centre lying within ourselves and speak about it in terms of a human language shaped by the exigencies of human intercourse. Any attempt rigorously to eliminate our human perspective from our picture of the world must lead to absurdity. (Polanyi, 2015, p. 2)

The way Polanyi insisted on this centre within ourselves was developed further when he suggested that we can in fact know more than we can tell—an idea of human knowledge that he considered would bring, in his terms, an harmonious view of thought and existence, rooted in the universe. Today's understanding of social cognition research is that (i) our everyday experience of ourselves and of the world consists of a series of discrete microstates, and (ii) affective structures and systems play critical roles in governing the formation of such states. As Kurak (2003) explained:

It appears that intention of any sort is manifested in terms of a kind of hypothesis about what is to be perceived or done next. The hypothesis is based on the contents of latent emotional memory systems combined with feedback from the preceding moment of experience. At the neural level, it has the effect of governing brain dynamics so as to make it increasingly likely that the brain will settle in a meaningful state. (Kurak, 2003, p. 341)

So, just as with our preceding example about vision, our latent dispositions are drawn into the service of directing attention to and filling out the content of each particular expectation.

From these findings arises the neuroscientific account of the co-emergence of self and other. This approach implies that no perception is possible without action; the cycle of action and perception continues, unbroken, halted only by the cessation of both. As Handscomb (2007) argued, it would be a mistake to regard an organism as an observer of a changing exterior world: the circle spins at the flickering pace of phenomenal time. It is impossible to know what comes first, stimulus or response. Buddhist metaphysic, namely, the dependent co-arising concept, parallels the descriptions of consciousness from cognitive neuroscience. As Kurak stated:

The theory of dependent co-arising suggests that our apparently seamless experience of the world depends upon a succession of causally induced states in which subject and object recurrently and interdependently arise and dissipate with no underlying permanent substratum to unite them. (Kurak, 2003, p. 342)

Different stages lead the way from the concept of dependent co-arising toward consciousness described as atemporal and containing all possible experience in potential form. The first stages involve six cognitive groups—sight, sound, touch, taste, smell, and state of thought/feeling—in calling upon conditioned, emotionally laden memory to direct attention and to provide meaningful form to content in the emerging moment. This results in the impression of an essential nonmomentary self and world. Central to Buddhist practices is the reduction of the unreflective impact of emotionally laden memory experience, which involves a difficult and prolonged process. Mindfulness to my presence with the other is a first step but again far from spontaneous in today's world. Bai (2003) brought attention to that distinction by stating that not all perceptions are of the same kind, as they are largely influenced by the perceiver's state of being. Her work points to the impact of devitalized percepts on our state of consciousness, and their consequences for the state of the world. It brings into this reflection the fact that our experience of the world, being fundamentally an individual process, self-meaningful in its complete subjectivity, needs to gain conscious perception of the synergic impact of others' subjectivity. When one feels this hidden terrain of others' subjectivity, one cannot fail to be responsive to them, a necessary process Nakagawa (2000, p. 209) described as the way of action from personal to social transformation. Autobiographical memory needs to find expression to be brought to conscious perception. As a teacher, I have always felt that I have an important responsibility to make a conscious effort to understand the memories of my own schooling. As described by Bullock in his book *Inside Teacher Education: Challenging Prior Views of Teaching and Learning*: "Teachers are up against three powerful myths gained from a lifetime of schooling: everything depends upon the teacher, teachers are expert and teachers are self-made" (2011, p. 3).

Hence, although I was able to gain a critical outlook upon my training as a scientist and to explore more holistic ways of creating space for mutual learning and interaction, I was soon to realize there is more to how one can be affected by such life

experiments. Slooka (2009) when writing *Dehumanized: When Maths and Science Rule the School*, conveyed some of the drama taking place in the schooling I knew:

I feel that we are more nurture than nature; that what we are taught is what we become; that torturers are made slowly, not minted in the womb, as are those who resist them. I believe that what rules us is less the material world of goods and services than the immaterial one of whims, assumptions, delusions and lies. (Slooka, 2009, p.32)

So, given the possibility that what we are taught is what we become, it is also one's responsibility to look beyond schooling, to walk down the path of memories and self-discovery. This is where one realizes that teaching is in fact learning, education happening within the interconnected network of being.

4.2. Inward—Outward

The phenomenological description of social cognition brings forward a continuum within self and others, with no empty space in between. Heidegger's elaboration of the concept of being-in-the-world carries specifically the notion that my daily experience is not derived from private, individualized subjectivity. As I have described above, how I get to know others does not happen in isolation from how I get to know myself. Some authors have linked this concept with the idea that the way one will engage in intersubjectivity is also dependent on early attachment with one's first caregiver. Introspection is definitely, in my mind, a first step in moving inward:

Social and relational aspects of human growth and development have been shown to be quite clear. This is a continuation of the recent movement in psychology and psychoanalysis to move past Cartesian dualistic notions of isolated subjects and decontextualized external worlds in order to better fit with the embeddedness, context-dependency, and mutual constitution of our actions and social being. (Reuther, 2013, p. 114)

Linking one's initial experience of intersubjectivity can be an interesting stand point in explaining difficulty in living fully this deep organic process of intersubjectivity, but I find it also tends to contradict itself by making most of the exploratory process an actual turn inward. Although there is much to gain in the liberating process of exploring our own

personal attachment-embodied memory, I am attracted with some urgency to a larger, more encompassing understanding of our place in our social network, be it family, workplace, or community.

When I was deeply immersed in this inward turn, I came across Emmanuel Levinas's work and his radical inversion of this idea of the autonomous and self-sufficient individual. Although I always knew I was part of a community, my schooling and early work in scientific labs kept pushing the notion that the pursuit of self-interest was a primary value and endeavour. In his book *Totality and Infinity: An Essay on Exteriority* (1961), Levinas placed a unique emphasis upon the physicality of the presence, the importance of the face-to-face, and his words gave me a way of explaining the kilometres I've covered and the focused energy I've expended:

[T]o posit knowing as a welcoming of the Other is not a pious attempt to maintain the spiritualism of a personal God, but is the condition for language, without which philosophical discourse itself is but an abortive act, a pretext for an unintermitting psychoanalysis, in which the appearance of a discourse vanishes in the Whole. Speaking implies a possibility of breaking off and beginning. (Levinas, 1961, p. 88)

I was struck by a new perspective on what is so wrong in the absence or rupture of the *face-to-face*, and in what I had experienced as a traumatic encounter with what Levinas described as the *evil genius*: "The evil genius does not manifest himself to state his lies: he remains, as possible, behind things which all seem to manifest themselves for good" (Levinas, 1961, p. 90). To remain behind a thing is what I had been trying to express earlier: when faced with the recognition that intellectual constructs that are in part or fully disconnected from human experience I felt reduced down to a *thing* existing outside the fabric of life itself. The "evil genius" is harmful for the position it takes of being disconnected from or even wanting to recognized the Other.

In my trying to recognize what I felt as profoundly upsetting in the takeover of neuroscience in education, I felt caught up in a power struggle between reductive ontologies and existential ones, but I was missing the point by polarizing the question. It is by taking relational responsibility, in a way Levinas further described as coming into being as an "individual," through relationship to the Other that I can engage the world

outside a perpetual *for* and *against*. As such, I am always, tied to the Other in a relationship of responsibility:

For Levinas teaching and learning are the communicative modes of the ethical relation where the “alterity” or distinctiveness of the Other can be preserved. The Enlightenment approach is one where the Other becomes an object of my comprehension, my world, my narrative, reducing the Other to me. The ethical relation is one in which I am willing to be taught, I am willing to learn from the Other: I can learn from the Other as one who is absolutely different from myself. In my exposure to the Other I can listen, attend, be surprised, susceptible and open to the Other. Commitment to a learning relationship opens us to communicative ambiguity, and to being altered—to rupturing our self, cultural and political certainties. Rather than attempts to arrive at a single account, it is in the tensions of difference that productive and less dominating relationships can emerge and where we might respond to the ethical demands to responsibility. (Hoskins, Martin, & Humphries, 2011, p. 26)

It is here, in this openness to the Other, that I find comfort in the fact that there is only room for the possible existence for an evil genius position in a society that refuses to take responsibility, to enter a relationship of responsibility. It is in this ethical relation that teaching and learning are developed and can achieve their full meaning, and it is in this relational essence of the language of education that a neuroscientific turn in education might become tangled. As I was struggling to find an ethical ground on which to talk, face-to-face, with all stakeholders, all Others caught up in the rabbit hole of sub-disciplines in ethics, I forgot to look over my shoulder and take responsibility for stepping into a more fulfilling intersubjectivity:

The measure of a moral life need not be the fulfillment of one’s own self-interested desires and ends, nor the fulfillment of a pre-determined set of duties. Rather, why not aim towards a capacity to welcome the unexpected and unknown; a willingness to suspend one’s own projects in order that another might flourish? In other words, if we reframe the criteria for what constitutes a moral life, desirable ends outside the traditional emphasis on rational autonomy come into view. (Chinnery & Bai, 2008, p.20)

As much as I struggled when revisiting modern moral theories to find something beyond pragmatism and utilitarian ethics, something that would help me navigate the takeover of human present and future by neurotechnological development, I can say that coming upon the work of Levinas brought peace to my sometime agitated quest; his

work reaches beyond humanism, brings to the fore my responsibility to the Other, and can be read as a proper ethics within post-humanist ontology. It is from such a perspective that education can gain full recognition of its relational nature, as we all participate in it as phenomenological beings. It is from such a perspective that education for the good can be defined.

4.3. Education for what?

In a conversation I had around that time with Giert Biesta, a philosopher of education, I felt the need to discuss my new perspective, face-to-face. He told me:

My own position would move more radically from phenomenology to existentialism, in a way in which I think that ultimately we need to deal with existential matters—such as responsibility for the other, being called by the other, how to act justly, etc.—in which theory (including science and philosophy) can either help or hinder or can be of no consequence at all. That is why for me existential matters are not ontological matters—that would reduce existence to theory—but existential in themselves. (Conversation, April 24, 2012)

Reducing existence to theory would indeed be a sad thing. The same applies to education, and Biesta has written extensively on the “split within the field of educational research between those who approach education as an activity or practice governed by cause–effect relationships and those who see education as a human event of communication, meaning making and interpretation” (Biesta, 2015, p. 11). In an attempt to move past the “for” and “against,” he suggested going to the source of the technological expectations about education, expectations that block the view to more crucial questions regarding what education could work towards. It is not an easy task to describe what education could work towards but as the main ground of human interaction within the world, I see the importance of fuelling into such challenging question an intrinsically utopian or idealistic element. This is what is so attracting to me (as oppose to schooling or school system which I will not discuss here). I feel that I have a better understanding of that technological expectation about education after having looked into functionalism and its origin, the mechanization of mind that came with it

bringing about, in our society, the need for a risk free education, a controlled process or even more, an enhanced experiment of data transfer.

From such quest for efficiency, some strange parallel from relational to mechanistic perspective can be drawn, when looking into research in education. For example, in the brief description of Kieran Egan's concept of *Learning in Depth* proposition one can read that each child is given a particular topic to learn about through her or his whole school career, and builds a personal portfolio on the topic, year after year, adding more understanding via an autonomous path of knowledge acquisition. Paralleled, currently, as Artificial Intelligence researchers's attempt to make machine learn. The latest exploit is called *Deep learning* where the idea is to allow computers to learn from experience and understand the world in terms of a hierarchy of concept, with each concept defined in terms of its relation to simpler concepts. By gathering knowledge from experience this approach avoids the need of human operators to specify all the knowledge that the computer needs. (Goodfellow, Bengio, Courville, 2016, p.1)

Why do I see those descriptions as parallel? There is a methodological sense to both and a strangely similar way of wanting the Other, be it a human being or a machine, to become autonomous. This is definitively oversimplification of two complex interaction, child-adult-knowledge and machine-adult-knowledge, but I want to emphasize the fact that I don't think we can keep supporting a humanist approach that would turn a blind eye to a posthumanism perspective, an ontology of all things, be it a tree, a cloud, a child, a river or a machine in interaction. In the example here, the two different relationships are not mutually exclusive and inevitably they end-up merging. In order to move away from anachronism, I suggest that we cannot fail to take into account our network of human, animal, inanimate object and all the interconnections among all of these because in such networks, there is no polarised push-pull about the past and the future. For this is what I find in posthumanism: not the simple recognition that humans are, indeed, animals but a deconstruction of the narrow humanist positioning of human being:

The posthumanist challenge is transformative and socially reconstructive (...) as a movement beyond the limits and contradictions of the humanist project (...) to transcend its regimes of truth, without at the same time setting itself up as the antihuman. (Carlson, 2015, XII)

This re-centering of the human subject is not happening without pain, and as Pettifils described, it is happening in a time of psychic unrest:

There are at least two possibilities for locating the posthumanist subject. The *decentered* human...the first is the decentered human, which seeks an end to traditional human domination of nonhuman subjects and the reconsideration of the human in relation to nature. The second is the *recentered* human, which seek the engage with past notions on classical/religious/secular humanism. (Pettifils, 2015, p. 34)

Again I don't think there needs to be a rupture within posthumanist approach, and *decentered* human and *recentered* human can well be the same one. The level of engagement with past notions is imbedded in what education could set as an aim in providing context for individual and societal introspection. This is again here the greatest aim of education would be to always stay engaged with the 'posts' since this label inspire not only a movement beyond the past but carry a dissatisfaction with the status quo. It is, for Taguchi (2016, p.38), a way of creating constructive relation where it is impossible to pull apart the knower from the known. In such a relation, the knower access knowledge embedded in her own fabric. The knower does not lose its autobiographic narrative in a decentered human, to the contrary: the question of why they embrace an epistemology better than another is not limited to unconscious logical system but to phenomenological exploration. It is not sufficient to uncritically 'buy into' (Gough 2014, p.255) a system in a passive way described, as reasons for choosing are often hidden to the individual and derived from personality type or accidents of experience. An education that leads to *accidents of experience* which I interpret here as describing an education that leave you with an impression of being stuck in a dead end can also be experience as a spring board to access new perspective on knowing and knowledge.

It remains that even in a posthumanist perspective, education is a process that should carry an intrinsic risk a creative space where the subject explores her subjectivity defined in term of a way of being that is not entirely determined by existing order and tradition (Biesta, 2014 p.18) but that is not living in a disconnected 'one' but as a being among beings. Posthumanism can potentially constitute and renew humanism in creating a non-individualistic subjectivity, an almost conscious application of cybernetic. Is it not what is in front of our eyes when faced with both *Learning in Depth* and *Deep learning*? From completely different perspectives, a process of spiralling the level of

learning is proposed, to a child, to a machine. This is in why a posthumanism perspective in education is fully integrative and even sends back as antiquated the notion of transdisciplinarity – such learning process does not even acknowledge discipline. The posthumanist subjectivity would be defined by its adaptability and intrinsic network. It is in its inclusiveness that postmodern subject can steer away from modern individualism by including in individual subjectivity the social bonds. As I hope not to fall head first into utopia, I feel that there are fundamental differences between posthumanism and Modernity's own utopia. Modernity gave us transhumanism because it was fuelling on the myth of the SuperHuman but posthuman intersubjective and communicational network give us an opportunity to proceed via social inclusion. Although the opportunity is there, it will remain to be seen if this will be the turn we will take since intelligent machines will provide concentration of power over information circulation within small groups of individuals. Already there is an admission within the different group working on *Deep learning* that this type of technology can only lead to profound social injustice and inequalities. For example, Bengio (2016), a AI researcher, predicts that we are bound to witness the worst social crisis unless we develop a solid social security system, much better than the current one. I see this as being a realistic view but what really strike me in Bengio's expressed concerns is exactly that: he is expressing deep concern, societal concern about his own work in AI. What education led him to integrate this elementary posthumanism perspective in his reflection on his place in the network? Without having to investigate his personal journey, the simple fact that he can discuss the impact of technological *Deep Learning* on society gives me hope and confirms the determinant role of education in shaping postumanity.

Bateson (1979) was among the first post-war anthropologist to link cybernetic and societal interaction. Using the model of communication network, his work opposed to the individualism of the time a new reading of culture and social system. In this view, education aims is to promote wider perspectives that bring into our system synchronicity and imagination. In his book *Mind in Nature*, he reflects on what he describes as the shortcoming of his occidental education by saying: "Break the pattern which connects the items of learning and you necessarily destroy all quality" (Bateson,1979, p.7). He resents schools for never teaching about "the pattern which connects":

What pattern connects the crab to the lobster and the orchid to the primrose and all the four of them to me? And me to you? And all the six of us to the amoeba in one direction and to the back-ward schizophrenic in another? I want to tell you why I have been a biologist all my life, what it is that I have been trying to study. What thoughts can I share regarding the total biological world in which we live and have our being? How is it put together? What now must be said is difficult, appears to be quite empty, and is of very great and deep importance to you and to me. (...) What is the pattern, which connects all the living creatures? Let me go back to my crab and my class of beatniks. I was very lucky to be teaching people who were not scientists and the bias of whose minds was even anti scientific. All untrained as they were, their bias was aesthetic. (Bateson, 1979, p.8)

Times have changed since Bateson's beatniks students but not the individualism they were fighting for, which is a sad thought, I find. An aesthetic perspective was part of what Bateson sensibility to networks of communication, amongst which we are perpetual learners: that is if we are educated to the aesthetic of "the pattern which connects." Those patterns describe the flow of information in a way that Bateson describes as been part of such a strong cultural unconscious metacommunication that it creates an intrinsic control mechanism to prevent changes. In that context, human beings are defined as informational beings permeable to the world they inhabit: this was to be starting point of the theoretical framework, applying cybernetic to posthumanism. Educating an informational being, a subjectivity in elaboration, is the challenge we face as a society in order to embrace life as non-individualistic being-in-the-world, but not past the point of being reduced to an informational component of a network, a pixel in a picture I can't access in full. I want to keep attending to thing as a phonemenological being.

4.4. Attending to things

As we attend to ourselves and others in an interconnected way, we take with us the memories of our existential being. Memory, in its phenomenological expression, reaches far beyond current neuroscientific descriptions of memory processes, and in that regard it is a powerful illustration of how much we can lose by embracing narrow scientific explanations frame outside posthumanist ontology. Each of our own personal narrative is what is guiding us in attending to things, and our narrative is a precious engram, memories that define our conscious and unconscious focuses on the world

around us. If losing my hearing has been a life-changing event for the best, it is easy to admit that losing my memory would be the end of my subjective being. Like people recovering from injuries who are left with no trace of the narrative they once lived by, they are facing the challenge of having to reinvent themselves from scratches. Some of the informational network of our technological world, sometime described as external memory, does not stand the comparison with the richness of organic memory system. It simply has nothing to do with functional capability but with the richness of creative power feeding directly on emotional life substrates. For this reason, neuroscientific inquiries into memory processes are currently turning to art for insight, recognizing that emotional memory are unmediated and that our automatic responses to art apparently is physiologically more significant than cognitive long-term memory recall:

Ricoeur, a philosopher of hermeneutics and literary theory, predicted that the overriding orientation of neuroscience in the future would be to juxtapose objective experimentally recorded activities with the incredible richness of a living biology. (Nalbantian, 2011, p. 7)

There is nothing new in recognising the powerful grip of aesthetics in human life as a mean of expression and humanity did not wait for neuroscience to validate this understanding but I think the transdisciplinary study of artistic production bring interesting way of bringing it back to attention in our information society: attending to art is not yet part of machine's *Deep Learning*, and so we can claim this capability as defining an important part of our subjective self. Modern autobiographical literature of the 20th century can be seen as a laboratory for the study of the encoding, storage, and retrieval of episodic memory. The writings of Proust or Woolf have been analyzed as enacting memory experiences, and in that sense they provide liberating power by bringing to conscious perception autobiographical memory.

No sooner had the warm liquid mixed with the crumbs touched my palate than a shudder ran through me and I stopped, intent upon the extraordinary thing that was happening to me. An exquisite pleasure had invaded my senses, something isolated, detached, with no suggestion of its origin. And at once the vicissitudes of life had become indifferent to me, its disasters innocuous, its brevity illusory—this new sensation having had on me the effect which love has of filling me with a precious essence; or rather this essence was not in me it was me . . . Whence did it come? What did it mean? How could I seize and apprehend it? . . . And suddenly the memory revealed itself. The taste was that of the little piece of

madeleine which on Sunday mornings at Combray when I went to say good morning to her in her bedroom, my aunt Léonie used to give me, dipping it first in her own cup of tea or tisane. The sight of the little madeleine had recalled nothing to my mind before I tasted it. (Proust, Marcel, 1913, *Swann's way*.)

Understanding memory's phenomenological expression can be a unique way in understanding others and self, but its expression remind me of the importance of this personal narrative sustained by memory. From a humanist perspective we can see evidence of personal narrative from the one who are outliners, writers, musician, or visual artist with brilliant, creative powers that translate their memory experiences in their art. Just as Proust was in writing, Beethoven had been analyzed in terms of memory patterns:

Beethoven is the first composer to represent the complex process of memory—not merely the sense of loss and regret that accompanies visions of the past, but the physical experience of calling up the past within the present. In neuroscientific terms, he is the first composer to express the activation of long-term memory in musical form, using intermediate-term memory to create the effect of calling up events from the remote past. (Hertz, 2011, p. 359)

Both examples bring forward the emotional content of memories and the way it define our individuality in the framework of humanism. As I work my way into posthumanism, I am drawn to revisiting some of the humanist affirmation, just as one would go through memories from a remote past, just like at a crossroad in life.

I'll sometime look back to confirm the way forward. According to philosopher Charles Taylor (2007 p.484), authenticity means that it is up to each of us as a human being to be true to our authentic self. Since we come to have authentic selves my following our very individual narrative and that this narrative is rooted to our memory, it gives to memory an essential role in what we call ourselves. This very fragility of self as sustained by memory is at the center of human experience. This, I suggest might carry forward in a different way into posthumanist time. Link to the necessity brought about by modernity for each individual to formulate and to give meaning to its existence as an individual detached from the world can be revisit in posthumanism as more inclusive, as a narrative of our interactions recognizing how not only society provides the fabric of our

narrative but all objects alive or not, human and non-human. To push the idea further, what would happen if, instead of memory, or one sense—hearing or sight—fading away, shrinking to nothingness, it were one's emotional life? It would almost be like turning into a robot since a robot is, simply put, a machine following a program even a learning program, with no emotion. And if that were to happen, sadly, you would find yourself amongst kin in a world where artificial intelligence had taken over:

For is it not possible that science as we know it today, or a search for the truth in the style of traditional philosophy, will create a monster? Is it not possible that an objective approach that frowns upon personal connections between the entities examined will arm people, turn them into miserable, unfriendly, self-righteous mechanisms without charm or humor? "Is it not possible," asked Kierkegaard, "that my activity as an objective observer of nature will weaken my strength as a human being?" I suspect the answer to many of these questions is affirmative and I believe that a reform of the science that makes them more anarchic and more subjective is urgently needed. (Feyerabend, 1975, p.154)

I totally embrace the powerful irreverence of Feyerabend regarding the scientific takeover of society and schooling, science installed as an ideology. School system gives a privileged place to scientific knowledge and methods, giving it a credibility that is denied to other sources of inquiry into life. First-person accounts need to be given a voice, since it describes the lived *experience*, the subjective side associated with cognitive and mental events. This contrasts with third-person descriptions that, although provided by human agents, are not directly linked to the human agent who came up with them, giving them an apparent objectivity, which is central in current techno-scientific society. Based on this presupposed objectivity, Zahavi (2007) insisted that if we wish to comprehend the performance and limits of science, we have to investigate the form of intentionality that is employed by the cognizing subjects:

It's one thing to have a scientific representation of the mind as "enactive"—as embodied, emergent, dynamic, and relational; as not homuncular and skull-bound; and thus in a certain sense insubstantial. But it's another thing to have a corresponding direct experience of this nature of the mind in one's own first-person case. In more phenomenological terms, it's one thing to have a scientific representation of the mind as participating in the "constitution" of its intentional objects; it's another thing to see such constitution at work in one's own lived experience. (Thompson, 2004, p.385)

As I celebrate the expression of how I experience life with a responsible attention to Others, with no more need or purpose in seeking scientific understanding, I remember this line from William James: “Each of us literally chooses, by his way of attending to things, what sort of universe he shall appear to himself to inhabit” (James, 1890, p.424). This is one thought I think I want to hang on to in an era of human interaction transformed into information transfer. Munster (2011) describes in her book, *Materializing New Media: Embodiment in Information Aesthetics*, a new abstract motion portrait of a dancer as following:

In an extraordinary new media work, the collaborative team created an abstract motion portrait of the dancer drawn from a changing database of information captured through motion sensors places on their hands. The dancer artistry embedded in his fingers joints and muscles is translated into a set of data. (...) These processes allow the production of an entirely different kind of image of the self no longer based on appearance but instead expressed through motion and across time. (...) For the audience in whom abstraction can indeed produce sensate responses the informatics portrait could not be more embodied. The dancer’s muscular-skeletal system, trained and refined through years of choreographic experience is traditionally presented as a total and externalized form in the spectacle of dance. But with the data, we gain visual access to the energy of dance. (...) Informatics bodies no longer summon the immediate of corporeal existence. (Munster, 2011, p.178)

I’m drifting here into sharing the experiment of the disembodiment of a human dancer who gets his life back via the embodied sensory experience of a viewer, in a near future theatre-screen. I can’t resist but to close my eyes and see my daughter dance. My memory of her dancing is so vivid I feel I can reach and touch her in an embrace of love. My memory is of her and the emotion that her dance carries. It is fragile, and it defines me. I hope our posthumanist future as room for emotion and fragility.

Summary

In reclaiming my embodied phenomenological being, I become we, in what many cultures have described as co-arising between subject and object or subject and subject. After what started as an inward questioning, my inquiry led me into an outward movement, including a recognition of the other but mainly of the intrinsic responsibility to the other within intersubjectivity. It is in this context that education acquires its full

meaning for me and becomes a living process, a sharing of personal narrative, a transformative exploration of one's phenomenological being as staged in a posthuman ontology.

4.5. Postscript

The question is in every verse in every world: Are you there? In every verse, a relentless questioning, full of worry and fear of aloneness. For without the Other, there is no resonance, giving life to the self.

Poem 4. Artless — Brenda Shaughnessy (2012)

is my heart. A stranger
berry there never was,
tartless.

Gone sour in the sun,
in the sunroom or moonroof,
roofless.

No poetry. Plain. No
fresh, special recipe
to bless.

All I've ever made
with these hands
and life, less

substance, more rind.
Mostly rim and trim,
meatless

but making much smoke
in the old smokehouse,
no less.

Fatted from the day,
overripe and even
toxic at eve. Nonetheless,

in the end, if you must
know, if I must bend,
waistless,

to that excruciation.
No marvel, no harvest
left me speechless,

yet I find myself
somehow with heart,
aloneless.

That loud hub of us,
meat stub of us, beating us
senseless.

Spectacular in its way,
its way of not seeing,
congealing dayless

but in everydayness.
In that hopeful haunting
(a lesser way of saying
in darkness) there is
silencelessness

for the pressing question.
Heart, what art you?
War, star, part? Or less:

playing a part, staying apart
from the one who loves,
loveless.

Chapter 5.

Philosophy of education: Sharing with educators

Overview: In this chapter, I reflect on how a philosopher of education can be an active participant in sharing with educators and all other stakeholders involved in education on defining (re-defining) the purpose and aim of education. Central to such dialogue is an urgent need of shedding light on toxic metaphors turning humans into data and by doing so, begin our coming home to a posthumanity embedded in the fabric of the world.

5.1. Education: Why a philosophy of education?

Some prominent scientific gurus are scared by a world controlled by thinking machines. I am not sure that this is a valid fear. I am more concerned about a world led by people, who think like machines, a major emerging trend of our digital society.
(Harari, 2015)

The neuro-turn entered educational research as part of a quantitative focus within research on education but more generally as part of the neuroscientific discourse that became prominent in our society. The neuroscientific explanation of just about everything caught my imagination until, in a sudden crash-landing it struck me that the neuro-turn was acting like a large clockwork in perpetuating a mechanistic view of living beings. The limited scope of such a view in education eluded me until I felt the emptiness of a disembodied narrative in which the relational fabric of education was relegated to being some backstage artefact. Education was losing its clear, qualitative distinction from learning processes and cognitive neuroscience. I came to a clear “no”: education cannot be equated to learning processes. As express by Harari (2015) in the

quote above, humans who think like machines—without questioning, without meaning—can be more of a concern in our society than machines themselves.

As I emerge from my exploration of this sub-field of educational quantitative research called educational neuroscience, I question the education that leads to such a deadening journey. I question the attraction I had to disembodied inquiry. I question the competitiveness of the field I saw take shape before my eyes, the perpetual self-promotion that seems to be required in quantitative research, where “my data have to speak louder than your data,” an attitude that introduces every possible exaggeration and distortion of whichever data are in question. So from there, I have become increasingly concerned, even convinced, that what I was looking for could not come from quantitative research in education—which I again insist is totally distinct from cognitive science or any of the sciences attending to the biological processes involved in learning. Education is in another time and space. Education is what I feel when I close my eyes and see myself in a forest. It’s the end of October, and I must be eight or nine because I look up at my uncle as he shows me how to walk in silence on the leaves and branches of the forest floor—we are hunting for partridges. Education is this feeling I have when I see a deaf child trying to speak; one afternoon, at my Grade 3 desk (I can still feel the curve of the wooden chair), my arms spread across the desk and my head resting on my sleeve, I observed that boy who was deaf and had never spoken a word, that boy reading out loud from a book, and the group clapping in one big wave that wrapped around him. Education is my grandmother giving me her recipe as I came to her with paper and pen; she gently put the paper and pen aside and told me to watch her cook. Education is one of my teachers whom I meet years later and who asks me with genuine interest what I have been up to. Education is embodied, rich, and transformative; it is an emotional interaction without border, a phenomenological moment that simply does not translate into data.

5.1.1. A relentless questioning

When it became obvious to me that I could not be exposed to what I had come to view as an arid environment, when I moved from neuroeducator to transhumanist, from neuroscientist to neuroethicist, the memory of a line read years before came back to me. Slowly at first, then imposing itself to the point where I had to pay attention, the line was

stating something along the lines that education should be a true opportunity for discovery, that meanings cannot be given, imposed, or transferred to you but that you have to discover your own meaning, your own understanding. Of all the books on education I have read in the past 20 years, it is this line from Lipman, Sharp, Oscanyan *Philosophy in the Classroom* (1980) that helped to lead me away from trying to make sense of a thing that did not make sense to me. In fact, Lipman et al. words were the first back then to help me distinguish between education and schooling, between education and learning:

All of us—not just children—have known what it is for things to lack meaning. It is a deeply disturbing experience, much more so than simply being puzzled. When we are puzzled, we suspect there is an answer somewhere that will yield understanding. But meaninglessness can be terrifying. (Lipman et al, 1980, p.12)

The work of Lipman et al. focused on introducing philosophical inquiry in an imbedded way within educational pathways early in life. His concepts expanded into a continuum, into a community, into a lifelong open door with others as members of society. I was inspired at the time by the idea of going after a system that conveys meaninglessness, and of using philosophical inquiry to understand the world and how to define our interactions with ourselves and others. I remember thinking that it would give everyone tools to access education in the spirit of *educere*, Latin for “to lead out.” Second, it would provide teachers and students of all ages with a philosophical foundation that would ground education within a larger scope of inquiry, from the personal journey involved in education to a critical understanding of whichever paradigm shift would be unfolding at any specific time. I remember thinking that education was in profound need of been redefined to integrate philosophy as a central activity. Little did I know that this would become a lifelong inquiry. What was education for, and what did it mean to be educated? Who am I within my community, and what do I value and care for in life?

So how does one start philosophizing? Peter Singer provided an important point about the whole idea of philosophy having to go about it’s questioning in every direction without yielding to the methods of science:

Philosophy is often thought of as a body of knowledge; but this idea makes little sense, because for virtually every significant statement that one philosopher makes, it is possible to find another who will disagree with it. It is better to consider philosophy as a method of enquiring into very fundamental questions that do not yield to the methods of science. In the Western tradition, since the time of Plato, this method can be characterised by a form of relentless questioning, in which the answer to one question only leads to a further question, and so on, and on and on. (Singer 1995, p. 45)

This relentless questioning is what Lipman was basically aiming for: to instil in individuals, early on, a way of life that would be beneficial for the whole:

The paradigm of doing philosophy is the towering, solitary figure of Socrates, for whom philosophy was neither an acquisition [n]or a profession but a way of life. What Socrates models for us is not philosophy known or philosophy applied but philosophy **practised**. He challenges us to acknowledge that philosophy as deed, as form of life, is something that any of us can emulate. (Lipman, 1988, p.12).

In questioning the potential impact of using philosophical inquiry or of this suggested *emulation* as an educational tool, and recognizing the great diversity of positions within the field of philosophy, I cannot maintain the same naïve perspective on Lipman's initiative, as I feel now how much it took shape within a humanist perspective that I now challenge for having delivered an individualistic elaboration of subjectivity, a human-above-all scale of values. There are numerous critics of Lipman's concept of a community of philosophical enquiry (Biesta 2010; Vansielghem, 2006), and I have found echoes of my concern about the fact that the proposed educational tool offered by Lipman, in its integral methodology, might not have aged well. Biesta (2010) addressed this concern that the method offers a narrow conceptualization of subjectivity:

From an educational point of view the problem with humanism is that it specifies a norm of what it means to be human before the actual manifestation of "instances" of humanity. It specifies what the child, student or newcomer must become before giving them an opportunity to show who they are and who they will be. This form of humanism thus seems to be unable to be open to the possibility that newcomers might radically alter our understandings of what it means to be human. The upshot of this, to put it briefly, is that education becomes focused on the "production" of a particular kind of subjectivity. (Biesta, 2010, p.110)

I can take the full measure of the intrinsic risk of a prescriptive education, as I think it is a measure of the effort it took me to embrace my phenomenological being, my reclaimed subjectivity after an ideologically loaded education. But after gaining a broader perspective and understanding, I was glad to see that in revisiting Lipman after all those years, I was able to look at his ideas with more depth than upon my first reading years ago. I felt able to situate its content as corresponding to a specific time and place, a specific cultural content and distinct philosophical choices.

Those underlying choices were made within a framework of scientific inquiry, using *good reasoning skills, investigatory skills, conceptual skills, and translation skills* within an epistemological access to knowledge and without situating this knowledge within a sociology of association (Latour, 2005, p.9). Making such choices is one thing, but not openly situating them within a larger philosophical or sociological landscape is a limitation to the model. For what education could do by embracing a post-humanist perspective is not only look back at what did not work but cultivate a sense of being-in-the-world to which no humanism can give access. As Levinas concluded: “humanism has to be denounced . . . because it is not sufficiently human” (Levinas, 1981, p.128). So to attempt to define an educational approach that would be inclusive of the notion of responsible being, as proposed by Levinas, the subjectivity of a child, student, or other being is defined not so much by its intrinsic value as by its interactions with others. My interest here with the critic of Lipman’s *Philosophy for Children* pointing at lacking a post-humanist perspective is not so much about his work but more a part of my effort to gain understanding of how philosophical inquiry can enrich education. It is not about Lipman’s work per se but about enacting philosophy as an educational tool. So if I argue now that Lipman’s educational use of philosophical thinking is not adapted to a post-human epistemology, I must also acknowledge the dissident critics that come from other perspectives:

As conceived by founders Matthew Lipman and Ann Margaret Sharp, *Philosophy for Children* is a humanistic practice with roots in the Hellenistic tradition of philosophy as a way of life given to the search for meaning, in American pragmatism with its emphasis on qualitative experience, collaborative inquiry and democratic society, and in American and Soviet social learning theory. The program has attracted overlapping and conflicting criticism from religious and social conservatives who don’t want children to question traditional values, from educational

psychologists who believe certain kinds of thinking are beyond children of certain ages, from philosophers who define their discipline as theoretical and exegetical, from critical theorists who see the program as politically compliant, and from postmodernists who see it as scientist and imperialist. (Gregory, 2011, p.199)

The classical humanist framework of this pedagogy came to be criticized from all angles. The above critics are worth considering: this is where philosophical inquiry, one that includes more than analytical endeavours, one with relentless questioning of our intersubjective experience, exhibits its full educational value. In welcoming diversity of perspectives and in engaging responsibly with all it become life changing – it becomes educational. If it involves a change of conception and perception of what philosophy of education does, so be it:

the field of philosophy of education within North America, let loose from its historical moorings in the traditions of Anglo-American analytic and Eurocentric 'Western' philosophy, has important opportunities to reorient itself and venture in new directions that might enable us to increase our service and contribute to a world currently very much mired in social and environmental problems on a global scale (...) (Bai et al. 2014 p. 636)

In becoming active contributors, philosopher of education can engage in new directions that, by their intersubjective essence, will be better fit to our posthuman area. This is where I feel education can develop into a rich endeavour—when hidden agendas are also part of the conversation, are in fact the focus of the conversation, in an attempt to act and interact as responsible subjective beings. When I returned to Lipman's work, I felt I did not recognize myself in the certainty of the tone, a certainty that is not an interaction but a top-to-bottom affirmation, and in Biesta's words a *performative contradiction*. Recognizing such contradiction—a pedagogy of critical thinking framed in the scientific method—has been my reason for losing interest in quantitative research in education, in leaving behind ethical propositions that were dictating pragmatic and inclusive elaborations of values sustaining a view of human progress that I could not see anywhere around me.

Recognizing performative contradiction through rich philosophical inquiry could make it possible to consider a diversity of ideas and perspectives without wanting to turn them into a recipe to produce something—or someone. Education is in its essence a communicative endeavour and can easily be distorted into an exercise in engineering.

Education aims to “lead out”; there must be a way to create a space for philosophical inquiry that truly reaches out. In the short term, this latter aspect would, I think, prevent the field of educational research and practices from being so vulnerable to trends and “novelties” that leave many practitioners feeling caught up in having to participate in a mindless race forward. Giesbrecht (2015) has described how, over the last few years, the pace of educational change has reached epic proportions, mostly linked to the unspoken neuroeducational quest for a magic bullet:

I am told that “big data” will help to inform school practice. A colleague promotes yoga and mindful practice in high-needs classrooms and my child’s school division has incorporated an industry-led technology focus. We look to our past and towards the future, anticipating the “latest trend” and the “next big thing.” We have seen open classrooms, experiential learning, brain-based education, personalized instruction and professional learning communities, to name a few. . . . Teachers feel the pressure of trending in education, as expectations change and educational leaders ask for more innovation related to engaging students in the learning process. Unfortunately, transforming personal practice is not an intuitive or simple process. (Giesbrecht, 2015, para.1)

The rhythm of the emergence of pedagogy and educational practices is such that it is almost impossible for practitioners to reflect on them in order to sort out their framework—where they come from and where they can lead. As indicated by Giesbrecht, amazing proposals get mixed with technology’s latest gadgets. For educators standing on moving ground and having to juggle multiple praxis, a philosophy of education could provide all stakeholders with a common language. Not unlike how I started to investigate the impact of the neuro-turn in education, asking simple questions would help develop a common understanding. Where is the innovation coming from? What ideas does it support? What is my school’s philosophy of education? The list of questions could go on until it revealed the lack or presence of a foundational, shared language in research and practice.

As I found out in my own investigation, such space to discuss foundations is done far away from the classroom, in specialized publications and conferences. Taking the full measure of the impact of the neuro-turn in education can lead to questions such as those formulated by philosopher of education Volker Kraft (2013) in *The Attraction of Neuropsychological Findings in Contemporary Educational Thinking, or Feeling, Emotion*

and Relationship as Blind Spots in Educational Theory. Could it be that there is a blind spot in educational theory that opened the door to neuroscientific discourse? As discussed in Chapter 1, the logic of neuroscientific methods has introduced to educational theories a conflation of cause and effect, leaving the impression that it is possible to proceed directly from neuroscience to pedagogy. Doing so means that education conceived of as relational and inclusive, as rich in emotion, is left out in theoretical elaborations. Those essential elements of education are not structurally imbedded into any educational relationship—they have to be acknowledged, welcomed and nurtured. No education is possible without them:

Where in education theory do we find rage, outrage, resentment, indignation, annoyance, bitterness, hurt feelings or anger; where are pleasure, pride, amusement, lust and excitement, satisfaction and joy; what about love, trust, goodness, devotion and affection; where do we look for astonishment, perplexity, amazement and surprise; where are worry, pain, melancholy, dejection and desperation; where are fear, anxiety, apprehension, dismay, terror, horror, panic, guilt, shame, embarrassment, regret and remorse? (Kraft, 2013 p. 126)

Trying to convey the colour palettes of human emotional life, Kraft focused attention upon the emotional component of educational relations that makes going from neurons to classroom a bridge too far. In *Giving Teaching back to Teachers*, Barrow (1984) was arguing for what he saw as the displacement of philosophy by technician research into education. Focusing at the time on the fact that there were simply too many variables in educational interaction and that it was difficult to see “how one could ever control for them all in the manner of research in physical sciences” (Barrow, 2008 p.33), his work could maybe have had interesting impact if it at find it way outside academia. After spending over two decades as a teacher, and many further years as a student, I am still struggling to conceptualize such a discursive place, and it is not for lack of trying: exploring the field of educational neuroscience from the classroom perspective, from the research laboratory perspective, from conferences and specialized associations, reaching out on foot, by train, and by plane, did not lead me to find such a place. Given the complexity of interactions even when one is trying to define education, philosophy of education—which has a long, rich history—has a leading role to play in creating such a discursive place, to lead relentless questioning at applied, epistemological, and ontological levels. This is not a game that can be played alone; it needs an open field

and a transdisciplinary approach, since the players cannot be confined within any traditional disciplines.

5.1.2. Imprints of past civilizations

My main worry in the face of quantitative research in education is that before we, as subjective beings, can embrace the full colours of our interactions within the world, we run the risk of being reduced to data or learning machines and the like. Philosophers of education have been around since the beginning of occidental civilization, and a constant through the timeline of its elaboration is that they are often in a difficult position—always at the heart of societal evolution and exposed to complex interactions. One risk for them is to practice philosophy based on conceptions or traditions in a detached way from the society in which they live, staying in an enclosed space of intellectual exchange between themselves. In that respect, philosophers also acknowledge that the image they project is often one of intellectual games for insiders, combined with an attachment to the past.

As I looked into the past history of philosophy of education, it rapidly became striking how much influences and voices from antiquity were still talking to me in describing the current struggles in education. As described in fascinating detail by Amélie Rorty (1998) in *Philosophers on Education*, we are the inheritors of past conceptions of the proper aims and direction of education. The concept of *paideia*, inherited from the Greeks, is still very present in occidental society, to the point that it is reflected in the transhumanist obsession with achieving what those thinkers considered would be a perfect human. *Paideia*, or culture, posited an education based on a determined idea of greatness directed solely at male aristocrats. It was framed into a normative amalgam of epistemological, political, and anthropological positions. From the Greeks also came the inclusion of axiological and normative perspectives in defining education (Baillargeon, 2014, p.16). The sophists, who provided their wisdom—virtue education—to those who could pay, were questioned by Socrates, for whom there was no such thing as information transfer in education; instead, education was an invitation for each individual to engage in a quest for self-discovery and truth. Plato then grounded education within idealism: he contrasted *doxa* (opinion) with *episteme* (knowledge) in defining what it meant to be educated. Plato established the first Academy, and the

name itself came from the name of the garden where it was located, *Akademos*. Liberal education from the Greeks was still present in occidental culture even after the emergence of humanism during the Renaissance. The new conception of what it meant to be human, as proposed by humanism, would profoundly transform education by claiming that a scholastic education did not engage critical thinking and creativity because it used only memory.

If at an intellectual level much nuance and debate have endured, when I look at how antiquated is the way we currently educate our young, I would argue that philosophy of education has had an important impact in making the process of being educated more in tune with contemporary times, in any area we consider. At a time when philosophers are repositioning humans in the world—placing them within the world but not at the centre of any world—at a time when philosophers are elaborating upon the post-humanist worldview, even if I'm still going every day to *Akademos*, the ideas of embodied experience take me today into an age of responsibility to the Other.

Lipman might have been pushing a hidden agenda of empiricism and scientism, but there must be a way to include philosophical inquiry as an intrinsic component of education within posthuman society – being imbedded in the fabric of the world can't take place in a philosophical void. Shedding light on the philosophical and theoretical perspectives underlying specific approaches can greatly help us understand how these perspectives might be related. I have been privileged to meet with great philosophers of education, and I know their work offers more than utopian educational renewal—for their understanding of the past is the first step to making sense of today. It is a difficult task in our individualistic modernity, since the race forward does not seem to leave time to look over our shoulder: many, I have found, are convinced that humanity was reset with the digital revolution: no past, no present, only the future. That, in itself, is challenging, but at the same time, I can see in millennial youths the emergence of a new consciousness that has an aspect not only of universalization, but also of empathic sensibility towards others. Rifkin, in *The Empathic Civilisation: The Race to Global Consciousness in a World in Crisis* (2009), described this transition as follows:

The new consciousness emerged from the Third Industrial Revolution, just as psychological consciousness accompanied the Second Industrial Revolution and ideological consciousness attended the First Industrial Revolution. . . . The problem is that the same communication technology

revolution that is paving the way toward global consciousness as a dark side that could derail the journey and sidetrack that generation into a dead-end corridor of rampant narcissism, endless voyeurism and overwhelming ennui. (Rifkin, 2009, p. 554)

As I see demonstrations of this puzzling crossroad in the daily activities of millennial around me, I again perceive in these difficulties a renewed claim for an education defined as embodied, relational, and interpersonal. How do we make such education a public good and not the current individualized undertaking aiming at private gain, described by Levine (2006) as a profound shift away from values of community, spirituality and integrity and toward competition, materialism and disconnections?

As I have at times leaned toward believing there is little hope that I will live to see education established as a way to develop a meaningful philosophy of life, I can say that now I truly think there is a way. With some educators and as an educator myself—from unique intersubjective dialogues I have experienced—I have discovered infinite respect within educational relationships. Ruthellen Josselson, in her book *The Space Between Us: Exploring the Dimensions of Human Relationships* (1996), described what I have experienced as “moving with” others: “‘moving with’ has not been encouraged. It is clear that we have come to the edge of our capacity as a species to wield power over one another or to solve problems with force and domination” (p. 93). Such educational relationships cannot be institutionalized to fit mass production, which is in itself a very good thing: it means that to experience it, we have to give recognition to what it means to experience our intersubjectivity in an educational setting. How can philosophy of education contribute to the recognition of this simple fact and nurture intersubjective elements within community? I will suggest here that it is in the heart of educational community that respectful dialogue can best lead to a community of embodied learners.

5.2. Philosophy of education: Dialogues that move the world

For the ancients, the mere word philo-sophia – the love of wisdom – was enough to express this conception of philosophy. (...) Thus, philosophy was a way of life, both in exercise and effort to achieve wisdom, and its goal, wisdom itself. For real wisdom does not merely cause us to know: it makes us 'be' in a different way.

(Hadot, 1995, p. 265)

Educators are often aware of the role of relationships in education but feel caught in a system that gives no room for these: “The low expectations, breakdown of social order, and academic failure are only symptoms of the much deeper problem of alienation” (Bingham & Sidorkin, 2004. p. 6). In such a context, many philosophers of education are quite eloquent about the fact that these are troubled times for philosophy of education (Biesta, 2010; Mayo, 2011), describing the field as occupying a marginal position. Martin (2011) spoke, for his part, of the pressure for philosophy of education “to have to demonstrate the economic and social relevance of the research and the problematic ethical terrain facing philosophers of education under increasing pressure to produce work that has unambiguous, demonstrable practical value” (p.615). These conflicts are eminently present in philosophy of education, underlying the polarized position of education as an art and/or an applied science. The difficulty of communicating across paradigms does not make for easy conversation. In this dichotomy of us and them, I find it interesting to look at Nodding’s (2011) recent work on the dichotomy between science and religion and the impossibility of conversation between them. She draws on the example of a conversation between the biologist E. O. Wilson and a Baptist pastor (Wilson, 2006) to propose the use of a nuanced and caring language in an attempt to communicate and to solicit cooperation:

For you, the glory of an unseen divinity; for me, the glory of the universe revealed at last. For you, the belief in God made flesh to save mankind; for me, the belief in Promethean fire seized to set men free. You have found your final truth; I am still searching. I may be wrong, you may be wrong. We may both be partly right. (Wilson, 2006, p. 4)

This could have been a non-conversation. But when the topic is shared among interlocutors as a subject with its own particular perspective, interpretation become

open-ended and not a search for objective truth and power. As Tarmas (1993) described, the world comes into being only in and through interpretation. Subjects are culturally and discursively structured—as our two participants in the dialogue above—and we live in a linguistic universe in which discourse governs our knowledge and structures our sense of being and meaning. The importance of dialogue leading out of the us-versus-them polarization, as presented above, is very evocative to me, since it puts in interaction subjectivities that are often presented as incapable of entering into a dialogue. Richard Dawkins's (2006) *The God Delusion* has always exemplified to me the antithesis of dialogue: statements such as that the religious are delusional and scientists are bearers of the Truth leads nowhere and sends individual back into their individuality; no community is possible. So, with an understanding of the importance of a respectful dialogue, how can philosophers reach out in the community? Ruitenberg (2014) has talked about a more situated philosophy of education, one that keeps a critical distance even if engages in active dialogue:

Clearly, there are several ways in which philosophers of education can make productive use of other forms of research, but perhaps the engagement should go further, for who reads the questions philosophers ask about educational practices and policies? If we take engagement as a one-way street, where philosophers of education engage with other educational research but other educational research does not engage with philosophy of education, then we might not have gained much. (Ruitenberg, 2014, p.91)

Such a situated philosophy is what she described as making philosophy from the ground up; in the case of the attempt to establish dialogue as a pedagogy—as an intersubjective pedagogy—it could aim at defining how to meet within the circle of respect. It could fall in the sphere of radical education, because it would eventually lead to political deliberation with educational institutions, policies, and practices and produce social change. But I suggest political action should not be the first step or first aim at this point. As described by Biesta (2014) in *The Beautiful Risk of Education*, a “risk” has to be taken, the risk of intersubjectivity: “The risk is there because education is not an interaction between robots but an encounter between human beings” (Biesta, 2014, p. 1). Drawing from my experience, setting the ground for such encounters requires self-awareness, attention to my own narrative. Do I consider myself competent to ensure my conduct as an autonomous being? The emotional content of entering intersubjectivity in

full, although appealing, is not a given in many circumstances. As you walk toward the other, you cannot sweep away affective phenomena, caring, normative judgments, and paralysis of one's self-esteem. Invariably, not only would that make entering into interaction difficult, but the interaction would be less than fulfilling. In an intersubjective perspective, emotions are bound to influence autonomy and impact one's capacity to engage as a free agent. The philosopher Paul H. Beson (2000), in *Feeling Crazy: Self Worth and the Social Character of Responsibility*, presented the importance of this introspection: "Just as venomous, degrading, inferiorizing social relations can break down our sense of our fitness to speak for ourselves as moral agents, so also caring, dignifying, democratizing social relations can repair damaged self-worth" (Beson, 2000, p. 88).

So, it becomes a philosophical act of responsibility to establish ourselves as autonomous beings—a sense of self-worth is at the core of the autonomous being. Internalized values or beliefs can greatly affect this sense of autonomy, and they can come from many sources. It is a laborious but inescapable task to become aware of them. To define the influences upon and limits to full autonomy involves intellectual and emotional focus and tremendous attention to different frustrations, dissatisfactions, and emotional cues during this process of introspection. I know that for me, the path to introspection is in deliberate action, in motion, and in patient self-awareness. To gain, or regain, or nurture this sense of autonomy is the beginning of finding oneself available for dialogue in an open way and to be able to engage with the other. It is, in other words, a process of taking ownership, but strangely, as much as it *prepares* me to better enter intersubjectivity, it is a socially embedded healing process that can only take place within this intersubjectivity.

By suggesting the benefits of introspective work, I am far from putting forward the valorization of disconnected individuality, of introspection *ad nauseam*. I see introspection as a pre-dialogue stage, as a moment to welcome understanding, compassion and clarity, for as we grow up, not all experience provides energizing flow of light. Sadly, deadening experiences happens. Finding the words to describe the path out of darkness is what Leonard Cohen does best (Selected Poems, 1956-1968, p.245), as here:

I can't run no more
with that lawless crowd
while the killers in high places
say their prayers out loud.
But they've summoned, they've summoned up
a thundercloud
and they're going to hear from me.
Ring the bells that still can ring ...
You can add up the parts
but you won't have the sum
You can strike up the march,
there is no drum
Every heart, every heart
to love will come
but like a refugee.

Ring the bells that still can ring
Forget your perfect offering
There is a crack, a crack in everything
That's how the light gets in.

In an interview in 1992, Cohen elaborates on the philosophical ground of the poem:

'I mean if you have to come up with a philosophical ground, that is "*Ring the bells that still can ring*." It's no excuse... the dismal situation and the future is no excuse for an abdication of your own personal responsibilities towards yourself and your job and your love. "*Ring the bells that still can ring*": they're few and far between but you can find them. "*Forget your perfect offering*", that is the hang-up, that you're gonna work this thing out. Because we confuse this idea and we've forgotten the central myth of our culture, which is the expulsion from the garden of Eden. This situation does not admit of solution or perfection. This is not the place where you make things perfect, neither in your marriage, nor in your work, nor anything, nor your love of God, nor your love of family or country. The thing is imperfect. And worse, there is a crack in everything that you can put together, physical objects, mental objects, constructions of any kind. But that's where the light gets in, and that's where the resurrection is and that's where the return, is. It is with the confrontation, with the brokenness of things'.

So on I go to say that yes, there is this need for introspection as a way to let the light in and gain responsibility for self and others. The poet rending of the powerful experience that accompanied attending to brokenness and this story. One day, I gave my friend a stained glass window I had worked on for weeks. In my hurry to surprise her,

I left it leaning on the window seal. It fell and shattered the corner pieces of green interweaving glass leaves. She insisted on keeping it like that. I ended up fixing it - mender of broken glass - but left one shattered piece of glass for light was beautifully going through it. In the introspective process, not everything needs to be fixed but more simply, acknowledged. To envision education as a transformative dialogue, as an intersubjective encounter within the world is the starting point of a philosophy of education.

5.3. Philosophy of education: Finding home

What is the purpose of education if it is not to offer an opportunity for transformative dialogue and the exploration of our profound intersubjectivity? What is education if it doesn't lead to finding home within ourselves and within the world we are so deeply embedded? I argue here for a philosophy of education that provides a home, a multidimensional space and expended time with no door where I can feel connected, a place that nurture empathy. Empathy, this human capacity of resonate to emotion in others - not limited to other human - could help bring about a decentering of human subjects and participate in a world-forming processes. In the book *Born For Love: Why empathy is essential- and endangered*, Perry and Szalavitz (2010) discuss the fact that throughout History, empathy has always been the cornerstone of morality and to be today so absent in the Western world that it could be considered as endangered. Not only is there a limited time and space to feel interconnected but the connection we have are mediated from a distance in the virtual world. Even in this somewhat dark envisioning of our level of social empathy I think it is important to keep in mind the line from the social philosopher William Irwin Thompson:

(...) the appearance of a crisis can be read as not simply noise in the system but as he signals of the emergence of the next level of historical order. (Thompson, 1985, p.82)

This noise in the system can have many names: dissolution of the community, commercialization of education, obsession with scientific innovation, production growth for growth's sake, mechanization of humans, etc...all raising the question of what exactly will be the next level of historical order – toward more empathy? Nowak (2011), a

mathematician biologist present the evolutionary argument that, in the face of the increasing complexity of our interaction with and within the world, complexity level itself should trigger cooperation and empathy. As I'm questioning this use of mathematical modelling of empathy's dynamic in a network and thinking that we can't just sit and wait for empathy to kick in, I realize that the fact that empathy is gaining attention in the last few years might very well be generated by the ambient complexity. The 'empathic concern' (Baston, 2012) could very well be triggered by humans' systems reaching an unprecedented complexity level. Empathy is at the heart of our intersubjectivity as co-intentionality and society could benefit from empathy being at the centre of a philosophy of education as we start to embrace our posthumanity.

5.3.1. Expending intersubjectivity

It should be the simplest thing in the world. We are all bound by social interaction; we all live in a society; and we are all cultural animals. Why do these ties remain so elusive? (...) One reason has been offered up as an explanation. The adjective 'social' designates two entirely different phenomena: it's at once a *substance* and also a *movement* between non-social elements. (...) there is nothing more difficult to grasp than social ties.
(Latour, 2005 p.586)

I have much interest or should I say hope, in the prospect of a society that would shed from ontologies of the past. Although I have argued in this chapter for the importance of learning from the history of civilization, I think it is timely to develop a philosophy of education grounded in posthumanism and aiming at reconstituting a sense of community held together by affinity and ethical accountability. By introducing a qualitative shift in our thinking about our relationship to the other inhabitants of the planet, we also embrace what Latour (2005) has been developing at the social level: to define our interaction as being both substance and movement in distinctively. Latour's objective is to contextualize the emergence, stabilization and acceptance of a scientific fact outside the postulate of modernity who did posit human as subject and nature as object in a framework that was blind to subject-object hybrid present and actor of the scientific inquiry: 'So long as humanism is constructed through the contrast with the object that has been abandoned to epistemology, neither the human nor the nonhuman can be understood' (Latour, 1993, p.136). In this view, I will argue, rest the conceptual

framework of posthumanism. I am sketching here a posthumanism that does not imply erasing what defines human but it proceed into redefining relation within networks. It is in his recent work *An Inquiry Into Modes of Existence* that he bring forward framework, although without naming it as such:

To risk a chemical metaphor, if we note humans as h and nonhumans as nh, it is as if we were now following long chains of polymers: nh-n-nh-nh-h-h-nh-n-nh-h-h-h-nh, in which we could sometimes recognize segments that look more like 'social relations' (h-h), others that look more like aggregates of 'objects' (nh-nh), but where attention would be focused on the transitions (h-nh or nh-h). (Latour, 2013, p.423).

By reaching over ontological discontinuity of the Modern, Latour present a way to use the interconnection of all to reposition transdisciplinarity as central in scientific inquiry. I found it a good starting point to reposition human being in the fabric of the world. Although he has been label in turn 'empirical philosopher' or 'relativist' by critics (Skirbekk, 2015, p.47) I don't discuss Latour work in sociology of science as if it was the one and only doorway to transit into a posthuman era. In fact one aspect of the critics mentioned above I found troublesome and it's the nature of the actors Latour identify as part of the network – there seem to be a cultural component that limit the field of vision:

But the idea that one discipline – the Latourian version of anthropology – could be able to provide the (one and only) adequate conceptual overview of the whole of the modern world, with its plurality of values, activities and institutions, and of all the other disciplines with their various perspectives and insights, is naïve (...) As to the question of representiveness: what about ordinary people, and their everyday experiences, from around the globe? (Skirbekk, 2015, p.47)

Since it is the everyday experience of ordinary people that is at stake in our techno-scientific society the last thing one need to promote is generalized abstraction of the everyday experience of our subjectivity. Exploring our posthuman nature would be better done within a truly encompassing network.

In defining intersubjectivity in those terms – both substance and movement – can be a way of resisting the inhuman aspect of our era ‘where ‘a form of neo-empiricism – which is often nothing more than data-mining – has become the methodological norm in Humanities’ (Braidotti, 2013, p.15). I have experienced this phenomenon in witnessing Education reduced to quantifying learning processes, not to mention the economics that sustains this shift in focus. More than a shift, it was in fact like navigating ontological uncertainty in the midst of what Braidotti describe eloquently as a world of necro-technologies:

a new necro-technologies operating in a social climate dominated by a political economy of nostalgia and paranoia, on the one hand, and euphoria or exaltation on the other. This manic-depressive condition enacts a number of variations: from the fear of the imminent disaster (...) to the accident just about to unfold and virtually certain (...) (Braidotti, 2013, p.22).

Her description of the state of our society entering the 21st century suggests that it might but a fairly simple step to recognize that humanism is not adequate to face the challenge ahead and at the same time been able to admit to the following paradox: ‘One could say that my interest in the posthuman emerges from an all too human concern about the kind of knowledge an intellectual values we are producing as a society today’ (Braidotti, 2013, p.24). I appreciate her introspective perspective as it helps me clarify for myself that I don’t experience the proposition of posthumanism in such a way – my perspective is imprinted in my own personal *Copernican revolution* in naming my self-in-the-world – and as such I don’t discuss humanism with nostalgia. I see in the elaboration of posthumanism a substance and a movement toward alternative schemes of thought, knowledge and self-representation. For Braidotti, human condition is replaced by our new posthuman condition: “The posthuman condition urges us to think critically and creatively about who and what we are actually in the process of becoming” (Braidotti, 2013, p.24). This is an inclusive *we* stated here, a *we* that reaches deep into the fabric of the world and beyond humanist anthropocentrism. I argue for a careful posthumanism and not a posthumanist-turn for the simple reason that I’ve grown weary of *–turn*: whichever they are, including the neuro-turn, they imply powerful takeovers and very little philosophical questioning. The careful elaboration I suggest in envisioning the post-human is in respect of the distinction to be made clear between existing in a network of

empathic being or existing in the narrow pursuit of an enhanced trans-human. The nuance is fundamental to me as the first is full of life and the second I found profoundly deadening. It is this life in elaboration that will keep me as a participant in a community of inquiry:

I want to think from here and now, from Dolly my sister and oncomouse as my totemic divinity; from missing seeds and dying species. But also, simultaneously and with contradiction, from staggering, unexpected and relentlessly generative ways in which life keeps on fighting back. This is the kind of materialism that makes me a posthuman thinker at heart and a joyful member of multiple companion species in practice. (...) I welcome the multiple horizons that have opened up since the historical downfall of andro-centric humanism (Braidotti, 2013, p.321).

By expanding my intersubjectivity to an infinite of subject and object, I become part of the world. It now feels so simple – I just took a very complex road to get there.

Summary

Philosophers of education are active participants in defining education for the posthuman by looking past the limitations of humanist norms of what it means to be human, beyond a predefined kind of subjectivity. The intersubjective nature of educational relationships makes it impossible to envision them being investigated in the manner of research in the physical sciences. Education cannot be mass-produced, and history reminds us of the central role of true dialogues in healing the world's brokenness. I argue for a philosophy of education that provides a home, a multidimensional space and expanded time, wherein I can feel connected—a place that nurtures empathy.

5.4. Postscript

Again a rhythm in the world, body – life – mind – body... so few words weaving a gigantic tapestry – There is no without. So limpid, so fully embodied in the fabric of the world – There is no without. There are disruptions that leave one broken and empty. But when life is fully lived, in resonance, nothing is left out – There is no without.

Poem 5. McQueen Is Dead. Long Live McQueen — Brenda Shaughnessy (2015)

There is no body without life.
There is no mind without
Body.
There is no without.

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