Out of our minds: Hacker and Heidegger contra Neuroscience

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> On the current neuroscientist's view, it's the brain that thinks and reasons and calculates and believes and fears and hopes. In fact, it's human beings who do all these things, not their brains …. (Hacker, 2012)

Brains, Minds and Myths

Is the brain of educational interest? Read in a positivistic sense, this question is easy to answer. For, in education today, there is palpable interest in the human brain. In lots of ways, such interest is understandable. Many working in the field of education have long been convinced that our understanding of how human beings develop and learn can be advanced by insights gleaned from empirical investigations into cognitive functioning. Hence the long-standing link between education and psychology. Yet, in recent years, the emergence of more biologically advanced understandings of neural structures in the brain – the field of what is now called 'cognitive neuroscience' – has propelled this interest in new and controversial directions.

The impact of this has been especially felt in educational practice where a number of packages for enhancing students' learning and performance, which claim to be grounded in scientific knowledge of the brain, have emerged. Enter the "brain based learning" programme Brain Gym™, which prescribes twenty-six physical movements, purported to trigger "whole brain learning" in school children (BrainGym 2011). Among Brain Gym's more remarkable claims is that children have special areas on their bodies known as "brain buttons" which, when stimulated, can trigger a heightened focus for their visual systems of reading and writing. While the Brain Gym website itself admits that "it is not clear yet 'why' these movements work so well" (2011), such packages continue to flourish, heralded as important and innovative educational "tools."

Academic researchers working in newly formed Centers for Educational Neuroscience have been more cautious. In fact, many specialists in educational neuroscience are now keen to expose the 'neuro-myths' they perceive to be at work in education, and particularly within the 'brain based learning' industry.[1] And it is worth noting that programmes such as Brain Gym™ constitute only one portion of this. As Usha Goswami (2006) suggests, the neuro-mythology might well extend to ideas as familiar as critical periods of learning development, notions of visual, auditory and kinaesthetic "learning styles," and the well-worn view that the left and right hemispheres of our brains are responsible for different types of thinking. It seems, then, that those working in education and neuroscience are currently involved in a complex cleanup operation.

At the same time, researchers are somewhat optimistic about what the new knowledge of the brain rendered by neuroscience can offer to education. Hence a recent report entitled *Neuroscience and Education: Issues and Opportunities* (Teaching and Learning Research Programme 2011) concludes by affirming that "neuroscience has a fundamental and increasing relevance to education" and that "to ignore the relevance of present neuroscientific understanding to education flies in the face of a common-sense connection" (24). The pressing task thus seems to be one not of justifying

whether neuroscience is of educational interest, but rather of forging the best *way* this utility can be realized. In this spirit, a strongly advocated approach is the fusion of neuroscience, the biological and physiological account of the brain, with psychological concepts of the mind and mental processing. As the Report recognizes, a big challenge for educational neuroscientists is to bridge the divide between the biological/physiological picture of the brain presented by science and the actual or 'direct' processes of thinking in human beings. And it is here that the neuroscientist must turn to the psychologist, and vice versa, "for when cognitive models and our knowledge of biological processes inform each other, we can feel more confident about both" (17).

Let us return to our opening gambit. We asked if the brain is of educational interest, and immediately we saw that surely it is. Is this all there is to say? Certainly not. For, as is so often the case in such matters, the fact that something actually *is* of educational interest begets a further question, namely, whether the brain actually *should be,* or *is worthy of holding,* such interest. Here, our question becomes an explicitly philosophical one. Of course, as we noted above, those working in the field of educational neuroscience believe there to be a 'common sense' connection between brain science and education – thus suggesting it is taken-as-read that the brain should be of interest to educators. We do not want to deny such a view wholesale here. Nevertheless, we do want to suggest that this interest should be acutely aware of its limits: for there are areas in which the extension of biological knowledge of the brain does not make *philosophical* sense – and in fact constructs a picture that holds pernicious influence over education and its associated practices.

Before spelling out our position in detail, let us bring into view the picture that holds the educational neuroscientist captive. We have just noted that one of the largest problems facing educational neuroscience today is how to bridge the 'explanatory gap' and translate the physiological account of the brain, which is increasingly being unfolded via scientific investigation of neural networks, into education. In other words, one of the major issues facing educational neuroscience is one of the key problems facing the discipline of cognitive neuroscience more broadly: that of showing how the new scientific knowledge of the brain can be used to say something meaningful about the cognitive capacities of human beings. What tends to happen is that this task gets adjudicated by way of psychology. Hence cognitive neuroscientists – and, as we saw above, educational neuroscientists follow this lead – attempt to assimilate a biological understanding of the brain with psychological concepts and categories of concepts.

How exactly does this work out? Max Bennett and Peter Hacker (2003) have suggested that while early neuroscientists ascribed psychological attributes to the *mind*, contemporary neuroscientists reject dualisms and thus work to ascribe psychological attributes to the *brain* (14). Perhaps one of the most celebrated illustrations of this is the work of Benjamin Libet, whose experiment into voluntary decision-making was taken to demonstrate that the *brain decides* (or rather *a specific neural network within the brain decides*) to begin to act at least 2000 milliseconds before one becomes 'consciously aware' of having made such a decision. Such a characterization of the brain is shared by a number of leading neuroscientists: indeed both Blakemore and Young suggest that "the brain *knows* things, *reasons* inductively, *constructs* hypotheses on the basis of arguments, and its constituent neurons are

intelligent, can *estimate probabilities* and *present arguments"* (Bennett and Hacker 2003, 17). What the "interface" between neuroscience and psychology appears to come down to, then, is a particular mode of ascription of "psychological attributes to the brain and its parts," which is then used "*in order to explain* the possession of psychological attributes and the exercise … of cognitive powers by human beings" (2003, 7).

We have already seen how such a picture has come to take hold in certain areas of education. Indeed, the 'brain based learning' phraseology that has been on the rise in recent years in educational practice works, in a similar vein, to attribute cognitive powers of learning to the *brain* rather than the human individual. Yet it is worth noting here that a shared tendency is evident in the work of those academic researchers who, as we noted above, want to distance themselves from such pseudo-scientific programmes and their 'neuro-myths.' For example, the above-cited Report references a recent study into the fostering of creativity that has revealed that the degree of creativity a student's story was judged to possess was directly "linked to increased 'creative' brain activity" – that is, to a heightened activity in those areas of the brain "associated with creative effort" (Teaching and Learning Research Programme 2011, 23). Here, then, we find a clear illustration of the picture Hacker bring into view, wherein "operations of the brain … are being advanced as explanations for human behaviour" (2012). Indeed, the Report itself suggests that cognitive neuroscience operates with a model of "brain -> mind -> behaviour" in seeking to explain human activity – although it recognizes that such a model may well need to be "extended" and amalgamate insights from the social sciences (Teaching and Learning Research Programme 2011, 23).

At this point, question marks over the neuroscientific approach may well start to arise. Let us imagine that we want to explain why certain students have been able to produce stories that are more 'creative' than others (setting aside for now questions regarding the criteria of creativity). The neuroscientist comes along and tells us she has the answer: an fMRI scan has revealed that it is because those students have increased activity in the part of the brain associated with creative effort. Is this a good explanation? Hacker would argue not. In fact, Hacker suggests, what the neuroscientist gives us here is *no explanation at all*. For what the neuroscientist seems to be suggesting is that certain students have been more creative because their brain (or a certain part of their brain) has been more creative. Aside from seemingly making the classical logical blunder of shifting back, rather than solving, the problem, we might also ask: does talk of the creativity of the brain itself make sense? Of course, we might talk in ordinary parlance about someone having a 'creative brain,' but we do not usually interpret this to mean that the 'little grey cells' we all have inside our skulls are creative. For *human beings* are creative: not brains, not neurons, not cells.

This last point might seem trivial, but the principle aim of this chapter is to bring out its significance. In other words, and we shall aim to show, while Hacker's critique is focused on linguistic analysis, we should not misinterpret his point as *merely linguistic*. For making the point that it is human beings who think and reason, rather than their brains, does more than just clarify the language and terminology of the neuroscientist. The philosophical move being made here is not a janitorial one. Rather, the linguistic point has *metaphysical significance*: it opens up something important about the nature of human beings and the world they live in. This is

something Hacker himself attests to within his account.[2] Notably, however, as we shall also come to see, Hacker's account in important ways also stops short of drawing out the full implications of this. To take the analysis further, then, in the later stages of this chapter, we shall take a path through aspects of the philosophies of Wittgenstein and Heidegger. In doing so, we will work to show more fully how challenging the *language* of neuroscience constitutes a significant challenge to neuroscience as a whole. For the false pictures that it sets up and sustains of how human beings go on, in educational settings and elsewhere, are not to be explained in terms of its succumbing to neuro-mythologies: these are tantamount to neuro-*mystifications*.

Metonyms, Metaphors and Mystifications

Let us now recommence our consideration of Hacker's analysis. As we have already seen, Hacker's key objection to neuroscience is built upon a point of linguistic clarification. Neuroscientists, he states, have illegitimately extended psychological concepts – thinking, reasoning, perceiving, willing, and so forth – to the *brain*. Yet the brain, Hacker (2012) claims, is not "a logically appropriate subject for psychological predicates": and we can, as he points out, see this quite clearly from the fact that it makes no sense to talk of "the brain's thinking or knowing, seeing or hearing, believing or guessing" (19). Notably, Hacker adds to his critique by providing two explanations for this illegitimate move. The first is that it is rooted in an "unthinking adherence to a mutant form of Cartesianism" on the part of contemporary neuroscientists (2012, 20-21). What Hacker means here is that the way neuroscientists use and ascribe psychological predicates follows the usage first laid down by Descartes in the Seventeenth Century. Of course, Descartes ascribed psychological predicates to an immaterial *mind* – a notion that is intractable to the contemporary neuroscientist. However, in ascribing these predicates instead to the *biological brain*, neuroscientists merely repeat the Cartesian move on another (physical/material) level. We shall pick up the threads of this point a little later in this chapter. For now, let us focus our attention more on the second explanation Hacker provides for the illegitimate move committed by contemporary neuroscientists. This, in a way that is not unrelated to the first, consists in the claim that neuroscientists have fallen prey to what Hacker terms the "mereological fallacy." This means that they have come to ascribe to constituent parts of human beings attributes that logically apply to the *whole* (22). Thus psychological predicates, Hacker suggests, properly apply to the "whole living animal" and not particular parts of that animal (22). To say otherwise is tantamount to suggesting that the *eye* is what sees, rather that recognizing that it is *we* who see "with our eyes" (and a whole host of other things as well).

It is important to attend carefully to what Hacker is saying here, not least because certain possible objections to what he is saying quickly come into view. Indeed, it might be pointed out that there are circumstances in everyday life when it is entirely appropriate to speak of parts of our *bodies* doing (or not doing) things, rather than our "whole person." Consider for example the person who, after screwing up her eyes in the optician's chair declares, 'it's no good, my eyes are too weak to see the bottom line.' Of course, this person might equally have told the doctor 'I can't see the bottom line,' but the former way of talking is not reprehensible – and in fact it might be entirely appropriate, given the circumstances, to draw attention to and describe the physical impairment in such terms. And in a similar way, we might point out that

people have in fact come to speak in meaningful ways about the brain 'doing' certain things we might equally attribute to the whole person. Suppose I am teaching a philosophy class in the first lesson of the day. One of my students asks me a tricky question – say, 'Could you re-explain Russell's paradox about set theory?' I might well respond by saying: 'I'll tell you in a moment, when my brain grinds into gear.' Of course, I might equally here say: 'I can't think right now because it is 8:25am and way too early for me,' but the point is that the former way of talking is *not inappropriate* given the circumstances (and the question!). And perhaps, later on in the same day, a friend is telling me a particularly startling piece of information to which I reply: 'my brain needs to process what you have just said!' Once again, this is not a misconceived way of speaking, and it would surely be mistaken to say that the person is simply in error. Indeed, in cases like these, there is a metonymic usage of language at work – which is part and parcel of our everyday way of thinking and speaking with others.

Furthermore, it can be said that such a point may also be made with respect to the neuroscientific usages of language. Indeed, as Hacker himself points out, in key places, neuroscientists *themselves* suggest that their usage of language is figurative or, more specifically, metaphorical. A good illustration of this is given by neuroscientific talk about 'maps' of the brain – now a fairly commonplace notion within this field. These 'maps' are rule-governed nerve firings – 'topographic patterns of activity' – and have been described (by J. Z. Young among others) as the brain's language or grammar. In other words, brain maps are thought of as systems of representation through which the brain interprets the world. Hence, as Colin Blakemore suggests, brain maps are mediums of interpretation, in the same way that the maps of an atlas are mediums used by human beings to understand and interpret the world. Notably, however, Blakemore himself argues that this way of talking about the brain is not meant to be *literal*: it does not suggest there is "a ghostly cartographer browsing through the cerebral atlas." Rather, he claims, the notion of brain maps is invoked as "metaphorical imagery," the result of "empirical description, poetic license and inadequate vocabulary" (as quoted in Hacker and Bennett 2003, 31).

From this, Hacker's objection seems to be on shaky ground. For one, Hacker cannot be against or deny the usage of metonym in everyday speech. Ordinary language philosophy, after all, profoundly influences his thinking, and the acknowledgement of ordinary usage must at some point pull in favor of such contemporary forms of expression. Now, we could contend that Hacker would agree with this, and would not seek to outlaw metonymic usage in everyday parlance as merely fallacious ways of talking. However, and this is a key point, we would also contend that *the matter is quite different when we come to consider the use of figurative or metaphorical language in the field of neuroscience*. In other words, we would contend, there is a difference to be drawn between ordinary – language ways of talking and the ways language is used in neuroscientific circles. And this is because, in a way that is quite distinct from metonymic usage in ordinary language, what happens in neuroscientific parlance is that the metaphor is made to stand for the whole in some *reified sense* – as though the brain *actually is* the (only) thing that is 'doing' the thinking, processing, believing and so on. Of course, as we have just seen, neuroscientists such as Blakemore want to deny this and claim that they know 'full well' that the way they are using language is metaphorical. And yet – and this is the key point – it is difficult to see how neuroscientists really can defend such a claim. Hacker himself makes this

point, stating as he does that while we might well grant that Blakemore *et al.* do not *really* believe that there is a "ghostly cartographer" who reads maps within the brain, and that the phrase "brain maps" is used by virtue of poetic license or inadequate vocabulary, when we look a little more closely at what is being said by the neuroscientist, it becomes clear that the metaphorical language runs *much deeper* than is recognized. For, even when they try to jettison the talk of the brain as a ghostly cartographer, they still suggest that the brain, or some part of brain tissue at least, "makes use" of the maps in its navigation of the world; they still suggest that the brain, or some part of it, "operates with" maps in order to "interpret and represent" the world. In this way, then, it seems that however much Blakemore *et al.* want to claim they are 'just' using language metaphorically or figuratively, their claims about the brain are *so steeped* in this metaphor that it is difficult to see how they are *not* engaged in reification, and thinking of the brain as *really* what is 'doing' all of these (psychological, mental, human) activities. A *non-ghostly* cartographer is still, after all, a cartographer.

Perhaps we can make this point a little more strongly here and suggest that, in the language of neuroscience, the metaphorical uses of language *have ceased to be recognized* as metaphorical at all. Such a charge might fruitfully be compared to Nietzsche's critique of the epistemological drive to truth, in which we come to call 'truths' those illusions that we have forgotten are illusions: "metaphors which are worn out and without sensuous power; coins which have lost their pictures and now matter only as metal, no longer as coins."[3] And it is perhaps fair to say that, in a similar way to those envisaged by Nietzsche, the *conditions* for the neuroscientific reification – the forgetfulness of metonym and metaphor that we have just identified – lie in our own scientific culture and its associated epistemology, where scientistic and reductivist explanations for human behavior have become so entrenched, often with misleading consequences.

Before moving on to say a more on this last point, let us note that it is possible to put the challenge we are leveling here against the neuroscientist in another way. For the process of reification that we have just suggested the neuroscientist is involved in becomes equally (if not more) apparent when we take the following into consideration. In ordinary usage, it is usually possible to substitute a literal expression for the metaphor in question. For example, it would be possible to re-interpret the phrase 'life is a rollercoaster' in a more literal sense as: 'life is full of ups and downs, highs and lows.' Is it possible to do the same with the metaphorical statements used in the field of neuroscience? Perhaps not: or at least not as easily. For in the language of the neuroscientists, it is not clear what the *literal expression* we would want to substitute in would be. Consider a sample phrase from the neuroscientist's repertoire such as 'the brain operates with maps in order to interpret the world.' Now, what is the corresponding literal expression for this claim? If the neuroscientist says it is to be found in some description of electric-chemical changes in the brain, this would surely undercut the very move (to the mental) that they are trying to make. And, from this, another – somewhat more pernicious – challenge to the neuroscientist might be envisaged. For, we may well come to question whether the language of the neuroscientist is, in the end, *metaphorical at all*, rather than *mystification*.[4]

Can we take these challenges any further? Indeed we can. As we stated at the beginning of our chapter, our aim here is to show how the linguistic challenges we

can make against neuroscience have a *metaphysical significance*: for they open up something important regarding the way we understand human beings and how they go on – in educational settings and elsewhere. Now, as we also outlined earlier, while Hacker's account can take us *some of the way* towards seeing this, it does not take us as far as we would like to go in this chapter. And, at this stage, it is perhaps worth noting that the reason for this is that Hacker does not, in our eyes, fully draw out what is *wrong* with the forgetfulness of metaphor – or indeed the mystifications – that we have just charged the neuroscientist with being engaged in. What we are appealing to here, more specifically, are problems that arise from both (i) the picture of the human being that is *sustained* by neuroscientific metaphors and mystifications, and (ii) the picture of the human being that simultaneously is *effaced*. As we have intimated, to develop this point we will bring our analysis to cross paths with the philosophies of Wittgenstein and Heidegger. Let us now see how this transition can be made.

Practices, Conventions and Rule Following

To begin with, let us follow a further thread from Hacker's own analysis. In particular, let us consider the way Hacker elaborates his aforementioned critique of the neuroscientist's use of the cartographical metaphor. Now, Hacker expands upon the reasons why he feels it is mistaken to use the phraseology of 'maps' to apply to procedures in the brain when he says:

> [A] map is a pictorial representation, made in accordance with conventions of mapping and rules of projection. Someone who can read an atlas must know and understand these conventions, and read off, from the maps, the features of what is represented. But the 'maps' in the brain are not maps, in this sense, at all. The brain is not akin to the reader of a map, since it cannot be said to know any conventions of representation … or to read anything off the topological arrangement of firing cells in accordance with a set of conventions. For the cells are not arranged in accordance with conventions at all. (2012, 33)

Hacker's point here is that something fundamental and intrinsic to a map being what it is – functioning *as* a map – means that this notion is not well applied to the domain that concerns the neuroscientist. For the neuroscientist is concerned with activities of the brain (such as clusters of brain cells) and these are mechanical, or, we might say, disengaged and abstracted processes. Yet the process of reading a map is categorically different to this. And the key difference, as Hacker emphasizes in the above quotation, comes from the fact that map reading is an activity that is made possible by virtue of certain *conventions*. Cartography, as we might say, is a human *practice* (to the extent that 'practices' can be defined as activities that are conditioned by conventions: which may extend from the simple practice of sitting in a chair to the more complex practice of driving a car or playing tennis). Yet the mechanical workings of clusters of brain cells do not operate in accordance with conventions at all. Hence any talk of the brain having 'maps' is a misapplication of the concept: brains don't read maps, human beings do.

Notably, Hacker does not take this account much further at this stage – a move that is perhaps defensible, given the overarching aim of his work in this area is to expose the "conceptual errors" within the field of neuroscience or, more specifically, within the description of the results that follow from the neuroscientist's experiments and

investigations. For Hacker, without such conceptual clarity, the neuroscientist "will not have understood what he set out to understand" and will hence be unable to publically communicate, in any meaningful way, the genuine positive results that this field can have (2012, 33). But it is perhaps worth *our* while dwelling on the account we have just opened here, by way of Hacker, a little more. For much remains to be said, and in ways that brings us more explicitly to see that what happens when neuroscientists 'misunderstand' the results of their investigations is that they come to set up a false picture of the human being – and one that can efface the ways human beings actually go on.

To see this, let us now cross over more explicitly to Wittgenstein and, in particular, his account of rule following – a move that does not constitute too much of a leap at this stage, given Wittgenstein's account is surely not far from Hacker's own mind when he invokes the notion of *convention* to differentiate between the human activity of map reading and the firing of brain neurons in the above quotation.[5] What, precisely, does Wittgenstein have to say on this? Charles Taylor (1997) offers us a helpful summary. We want to know how it is possible that human beings are able to follow rules. To find the answer, Wittgenstein asks us to consider what it would mean to say that a human being knows how to follow arrows (one example of rule following). Now, on the strength of a traditional (or what Taylor calls "intellectualist") reading, it might be claimed that the person who knows how to follow the arrows has in their mind (consciously or unconsciously) a certain premise that instructs them on the right way to follow arrows. Indeed, the presence of such a premise seems to be exemplified by the fact that, if a stranger appears on the scene who follows arrows in the wrong way (they intuitively follow the direction of the feathers, for example, rather than the point), our right-minded person can explain their mistake to them. In this way, one (intellectualist) answer to the question of what it means to say a human being knows how to follow rules is to say that they have within themselves an *explanation* of the right way to follow said rule, which can be articulated to others on the occasion that they go wrong.

However, for Wittgenstein, this intellectualist explanation leads to insurmountable difficulties. To see why, consider first that in any situation of rule following, any given run of cases, there is a host of different ways of "following-on" that are available. For example, the sequence 2, 4, 6, 8, may be followed by 10, 12, 14, 16, or by 12, 14, 16, 18, etc., or by 102, 104, 106, 108, etc. We cannot foreclose in advance the question of what following-on might mean to someone who is taught with the initial sequence, provided that some sense can be made of the ensuing sequence. Sequences and rule following are, we might say, open to development. Notably, however, one of the upshots of this is that, for any given explanation of rule following, there will remain an infinite number of points in the sequence at which someone could misunderstand (Taylor 1997, 166). Put otherwise, *explanations* (of how to follow a rule) are themselves open-ended and partial, because "every explanation leaves some other potential issues unresolved" (166). If we now return to our intellectualist account of rule following, we start to see the problem. For this account suggests that, to be able to follow a rule, what we need is some articulable understanding of what it means to follow on correctly in any given situation. And yet, on the basis of what we have just seen, it becomes clear that possessing such an understanding would also require us to understand all the *wrong* ways of carrying on, at the same time. In other words, we would need to have formulated and discounted in

our heads in advance all possible permutations and combinations of a particular run of cases. And yet, given rules are themselves open to modification and development, this would mean that to follow even the *simplest* of rules we would need to possess an infinite number of thoughts in our heads in advance. Obviously, this is impossible. This is not to make a skeptical point about rule following. We are not here moving towards the conclusion that we do not or cannot know how to follow rules – or that there are no rules, and everything can be interpreted in any way we like. Plainly, human beings successfully follow rules: we get it right, most of the time. The upshot is, however, that we need a different and more adequate account of rule following than that offered by the intellectualist.

We can move towards such an account by appealing to a point that brings us back into direct contact with the analysis offered by Hacker above: the intellectualist account appears to lose sight of the part played by *convention* in the following of rules. To develop this, let us return to our example of map reading. More particularly, let us consider, in ordinary terms, how a human being might come to learn how to read a map. Now, surely one of the obvious ways this happens is through their being guided by someone more skilled than themselves. (We set aside, for brevity's sake, the multiple ways in which a child's attention might first be guided by the movement of a finger and subsequently be drawn to looking at representations or patterns on paper, perhaps in the context of trying to find the way to a destination and so forth. All this would be stages in learning what a map *is* and, hence, preparatory to our example here.) The guide helps the novice to see when they are getting it wrong and making mistakes with their reading, and they will help the novice to *correct* their reading when such mistakes arise. And such correction – and this is the crucial point – is made possible by the fact that there is a *community* that sustains there being the correct way of reading the map, through the *conventions* that they agree upon and put into practice. Another way of putting this is to say that it is through what people do together that rules and possibilities of correctness come into view and come to be.[6]

To some extent, what we have said here fleshes out in more detail what we have already seen above by way of Hacker. Yet we can also add further detail to this account here. For it is important to note that conventions and practices are also flexible and fluid. Hence the correct way of reading a map might well be different, if one's concerns or purposes are different; the appropriate way to read a map can alter and change, according to one's priorities. Thus, we might say, there is never any *totalized* reading of the map – there are multiple ways in which a map might be used, all of which are sustained by human practices. In addition, and pushing this further still, we can say that rules and conventions themselves can change and be modified. Indeed, it can be said that such flexibility is a key part of what it means to follow a rule and to have understood the meaning of the practice to which the rule applies, in a number of situations. For we would not think that someone has learned the meaning of 'being a musician' if they simply played music by relying just on what is written in the score. Such an act might well produce accuracy, but it would fail to demonstrate the need for appreciation of the nuances of a piece and the possibilities of interpretation. Hence, as Charles Taylor puts it, a rule does not stand "behind" the practice, as an underlying formula. Rather "[p]ractice is, as it were, a continual interpretation and reinterpretation of what the rule really means" (1997, 178).

Of course, and as might already be clear, what we are saying here is not meant only to apply to the practices of map reading (or following arrows or playing music). Our aim in developing this analysis is to show in more detail what is at stake in human activities *in general*. Now, it might be objected that we are leaping here too quickly. More specifically, it might be objected that taking what happens in map reading as an illustration of human activity *in general* is controversial. This is, not in the least, because a map is a tool of abstraction. In other words, a map presents the world in *representational* form, which is quite distinct from the embodied, embedded way we relate to the world in our everyday lives (where our sense of the very same place, for example, might be different depending on which direction we are going in, what our purposes are in going this way, what has previously happened to us along this way, and so on).[7] Perhaps, then, it might reasonably be objected that reading a map does not work as an adequate illustration of human life in general. We would have been better off using a more 'everyday' example. Yet we would suggest quite the opposite. In fact, we would argue that our use of map reading as an illustration of what goes on in human life more generally works to demonstrate that *even when* human beings are engaged in abstractions (making representations, dealing with objective 'states of affairs'), their activity is still fundamentally imbricated in conventions and practices. For representations can only function as representations on the basis of certain accepted rules and understandings about what sorts of things legitimately count as such. Hence it can be said that even the more apparently 'objective' human practices such as map reading or mathematics are made possible and sustained through community, convention and purposes in the ways that we have demonstrated above.

Let us, then, start to draw out some of the implications from our discussion thus far. For one, we have seen that human activities are, *par excellence*, governed by conventions, rules and purposes. As we might put it, human practices are *conditioned* and *made possible* by conventions and rule following. Secondly, we have also now seen what is at stake in this idea more fully – we have started to see the nature of convention and rule following, which included an appeal to their flexibility and fluidity in the face of our concerns and purposes. And this brings us, as a third point, to see more fully just how problematic it is to talk, as neuroscientists are apt to do, about the *brain* carrying out activities that are normally ascribed to the human being: activities that require conventions, communities and concerns to make them possible. Of course, this is not to say that we cannot talk about events in the brain as operating in accordance with certain rules or patterns. Indeed (in a way that somewhat reopens the point about the usage metaphor we examined above), it has become somewhat commonplace now to use the phraseology of 'rules' and 'patterns' within science, and the science of the brain is no exception to this. Yet what our foregoing analysis highlights to us is that what is meant by a rule or pattern in this sphere should be understood quite distinctly from what it means to follow a rule or a pattern as a human being. For the notion of rule we invoke in relation to brain activity is understood after the notion of a rule in natural sciences where, as Charles Taylor points out, what we are conceiving of is some sort of timeless, universal, "which dictates movements of all bodies everywhere" (1997, 176). Yet rule following in the realm of human affairs, as we have shown above, is only properly understood with reference to communities and conventions: of which the brain has neither. Hence we must thus resist the intellectual temptation to equate what happens in the human world with what happens in the causal world of physical science. To make such an equation,

we might say, is scientistic and hence profoundly misleading: it creates a false picture of what makes it possible for human beings to go on in the way they do.

Humans, Purposes and World

Can we take our critique any further? We think we can. However, before we do this let us take make a slight detour and to entertain the possibility that our own account may have laid us open to certain problems.

As we saw at the start, a prevailing aim amongst advocates of neuroscience is to bridge the divide between the biological/physiological picture of the brain presented by science and the actual or 'direct' processes of thinking in human beings. The purpose is to *explain* the possession of psychological attributes and the exercise of cognitive powers by human beings. Our response to this has been to draw attention to the rule-following nature of human practices, in which purposiveness, concern, and use come together, in an internal relation. Brains or clusters of brain cells, we have said, do not themselves have purposes. But have we missed something important here? It has become quite common in biology to talk in semiological terms – about 'messages' being transmitted from one part of the body to another. Is this metaphorical? At first blush, our answer might well be yes, but perhaps things are more complicated than they seem. Biology operates teleologically: the purpose of the lungs is to absorb oxygen from the air. Of course, without some further elaboration, this sounds markedly incomplete: why is it that oxygen needs to be absorbed? In response, we then come up with something about the circulation system, and we end up by couching this, quite reasonably, in some notion of normal animal or human functioning. So if we admit, as it seems we must if we are doing biology, purposes at this level (that is to say, if we accept that explanations at the micro-level depend holistically upon macro-level accounts that identify a *causa formalis* or *telos* of some kind), can we keep purposiveness out so insistently when we are doing neuroscience (that is, when we are describing neurological reactions)? And given that the neuroscience in question purports to deal with mental processes as well, a negative response to our question would seem to play into its hands.

Now certainly, at this point, we can be tempted by the thought that the neuroscientists' purported explanations might work in the case of simpler animals' interactions with their habitat, though the description would need to take account of the affordances of the environment and, hence, be holistic in that respect and it would be purposive in terms of the forms of life described. So if this might conceivably be a valid approach for simpler animals, could it not be scaled up to account for human psychological reactions? What is there to separate humans from animals? Bringing our argument to bear on these problems will involve three inter-related moves.

First, then, a distinction needs to be drawn between the extension of the idea of purpose through biology, with its semiological ramifications, and the use of the term in relation to human beings themselves. The crucial difference here lies in the fact that it is impossible to make any sense of the life of human beings without reference to *their own sense* of what they are doing: that human beings have purposes includes the fact that they entertain them, and this is part of what characterises their mindedness. Animals of various levels of complexity can be said to have purposes too, but only in descriptive terms – that is, from the point of view of a human observer – and with a degree of anthropomorphism.

Second, the line that we have begun to draw here takes us back to the account of rule-following that is central to our discussion. If, to avoid unnecessary elaboration, we confine our attention to the rule-following behavior of higher animals, we can see that their relation to rules and the use of signs is markedly different from that of human beings. For the animal the sign functions with a regularity that is cause-like in its effects; for the human being the sign remains open to interpretation. Hence, if we recall that 2, 4, 6, 8 can be followed not only by 10, 12, 14, 16, but also, say, by 11, 14, 17, 20, and so on, we get some glimpse of the open possibilities of human practices. Quintessentially, language functions in this way, and this is the very engine of culture. To say this, it is worth noting at this point, takes us beyond what comes to the fore in Hacker's treatment of language.[8]

A leap is made in self-consciousness where rules are opened to new possibilities, and where interpretation and convention function there at the heart of the sign. The child does not just follow the rule but *knows* she is following the rule. How else could children's play-acting be explained?[9] And weighing the consequences of this can take us further than has been apparent in the insights from Wittgenstein upon which we have been drawing. The point is not that Wittgenstein's account is limited (though, as we shall see shortly, there is a sense in which it is), but that too much, or the wrong, emphasis on practices as language games can give the impression of a holistic smooth functioning and self-containment that obscures the broader perspectives within which this familiar feature of Wittgenstein's thought comes to the fore. It is helpful to consider how a different approach to our topic, via the thought of Heidegger, might have led us to a similar juncture.

In fact, taking this line of thought will quickly lead us into the third of our moves, which will bring together purposiveness and rule-following in relation to a better understanding of world. Heidegger's opposition to the Cartesian picture is every bit as strong as Wittgenstein's and the phenomenology of the examples that he advances early in *Being and Time* challenge the intellectualist position in particularly telling ways. The purposiveness of the "in-order-to" and the "for-the-sake-of-which" in his account is crucial to his wider position. One hammers a nail in order to fix a door-frame as part of a house or a church …. By the end of that book, however, it becomes clear that this ellipsis must be filled in by the being-towards-death that is fundamental to, and distinctive of, the ontology of what he calls *Dasein*. Indeed animals in a sense do not die – that is, their death is not preceded by anticipation, by that terror in the middle of the night at the thought of becoming nothing. And lacking this self-consciousness, the consciousness that calls into question what their purposes might be, they lack a sense of *world*. The notion of "world" or the "worldly" character of *Dasein* is worth emphasizing here, and it forms a key part of Heidegger's account of human existence in *Being and Time* and elsewhere. Crucially, this notion should not be understood merely as an optional extra: it is not as though human beings *incidentally* or *accidentally* have a world. Rather, the world is constitutive of human existence itself; as Simon Glendinning (2007, 78) highlights, it is "a 'wherein,' a 'whereabouts' or a 'there' where Dasein always already finds itself." The world concerns *Dasein's* "familiarity with existence," and human existence is fundamentally a "being-in-the-world" – which means, an existence that takes place within language, culture and so forth (80). The stone, in contrast, is without world; the animal is world-poor. Animals have only a habitat, not a world. Hence there is something

encompassing, self-conscious, invoked by the notion of "world" in Heidegger – which also brings into view an *unsteadying* dimension within human existence, a crucial aspect that can be obscured where emphasis on the holism of Wittgenstein's language games allows them to become picturesque.

There is good reason to think that something similar can be found in Wittgenstein's thought – say, in his response to skepticism, where, recurrently, peace is achieved only to be disturbed again, or in his remarks regarding religion and the understanding of other cultures in, for example, his *Remarks on Frazer's* Golden Bough (Wittgenstein 1993). Nevertheless, the thought remains recessive. Heidegger, by contrast, expresses this with a boldness that can itself appear excessive. And it is here that there is perhaps a limitation in Wittgenstein's account of language, as Rush Rhees has tried to show: Wittgenstein nowhere recognizes that a crucial feature of language is that we say things *about the world*.[10] Against the Cartesian picture, the impression one is given is of language in use – that is, in carrying out transactions, praying, telling jokes, etc. But in the richness of the plethora of examples, the sheer fact that we can say things about the world, and that the world is something about which things can be said, is obscured. That the world is something about which things can be said is, on this account, definitional of world. It is in the absence of this, most crucially, that the mental life of animals is different from that of human beings. And it is in the absence of the kind self-consciousness implied in this that the neuroscientists' attempt to ascribe psychological attributes to the brain and its parts, or to understand human mindedness by scaling up from simpler animal lives, is most disastrously exposed.

The 'explanatory gap' we identified at the start needs, then, to be placed differently, with greater emphasis given to the difference between the mental lives of human beings and those of animals. For while it would be wrong to deny connections, of course, it is from the top downwards that our ordinary psychological concepts are secured, and it is this larger picture that gives sense to expressions such as 'see,' 'perceive,' 'anticipate,' 'hope,' and 'fear' – even to the idea of *thinking* itself. And, it is in this way that we come to show how, we would argue, Hacker's analysis can be extended and strengthened. For by appealing to the notion of *world* we have sought to bring the larger picture into view, and to give a sense of the reach of the linguistic point with which we began. Let us now move to see where this discussion has taken us.

Education, Neuroscience and Beyond

What conclusions can we now draw about the question we posed at the start of this chapter, viz. the justification of educational interest in the *brain,* which has, in recent years, been given in new life by the emergence of cognitive neuroscience?

We have argued throughout against the utility of invoking biological descriptions of the *brain* as useful tools for explaining what human beings do with their *minds* – which is to say, what human beings *do* (for surely all human action – save bodily movements such as blinking and breathing – is minded, in some sense). We began to build a case for this through an emphasis on ordinary language, and in particular the analysis of the language of neuroscience offered by Peter Hacker. This helped us to show that when those in the field of neuroscience – and those in educational neuroscience who follow suit – talk about the *brain* doing things and performing

actions (e.g. a 'creative *brain*'), they engage in misleading reifications that, *at best*, perpetuate myths that have pervaded our understanding of the human mind since at least the time of Descartes and, *at worst*, beget new and more pervasive mystifications that halt progress and prevent more adequate understandings from coming to the fore. Not only, then, can it be said that such linguistic errors succeed in founding neuroscience on highly questionable philosophical assumptions, they also work to obscure the valuable evidence that neuroscientific investigations can bring. Furthermore, and more directly linked to education, it can be said that such modes of talking succeed in perpetuating the *instrumental* and *functional* conception of learning and thinking that has, in recent years come to prominence: thus bringing neuroscience under the sway of a certain reductive conception of education, rather than allowing this new field to unfold its own possibilities and openings. Indeed the present context of practice, where policy makers are keen to wrest judgement from teachers, in combination with the prevailing empiricist climate of research, where the medical model is recurrently held up as the best orientation for enquiry, make education peculiarly susceptible to the allure of neuroscience, whose glamour is only enhanced by the huge research funding it currently attracts. These are circumstances in which opportunistic claims are made for neuroscience in education.

Through our exploration of rule following, purposes and practices, we strengthened our critique by providing a positive account of human activity that again demonstrated its difference from the workings of the brain (however much these may be described, in biological terms, as operating according to certain rules, patterns or teleological principles). We came to appreciate the reach of this point when we turned to consider the notion of *world.* This brought into view the larger, 'top down' picture that needs to be invoked in any account of human activity, again emphasizing the incommensurability between this and the kind of explanation we are given on the basis of the somewhat linear neuroscientific account of brain -> mind -> behavior. Of course, as much as we can say that neuroscience, through this, becomes complicit in the instrumental and functional conception of education that holds sway today, we can also say that the messier, top down model we have brought into view here becomes obscured. This certainly seems to be the case in areas such as the development of 'critical thinking' or 'thinking skills' which, as the present authors have shown elsewhere, are entrenched in a reductive and instrumentalist conception of human thought and human beings themselves.[11] Of course, this is not to suggest that neuroscience as a discipline is incommensurable with this larger picture – and perhaps if the project of neuroscience became more aware of its own philosophical foundations it could find a way towards the sort of picture we have sought to elaborate here, which does more justice to the rich nature of human existence. This is an issue for a different essay. What we have sought in the present chapter is rather to show the vigilance that must be maintained in the face of current educational interest in the brain. And we have done so by seeking to demonstrate the full reach of the idea – misleadingly trivial in its appearance – that *brains* don't think, *human beings* do.

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[1] See for example the commentary by Teaching and Learning Research Programme, *Neuroscience and Education: Issues and Opportunities*, whose contributors include: Sarah-Jayne Blakemore; Guy Claxton; Anne Cook; Richard Cox; Uta Frith; John Geake; Usha Goswami; Christine Howe; Paul Howard-Jones; Ute Leonards; Carol McGuinness; Pat Mahony; Claire O’Malley; Sue Pickering; Iram Siraj-Blatchford; and Aaron Williamson.

[2] Of course, the point we are making here is one that invokes more generally to the procedures of Ordinary Language Philosophy, wherein clarifying the appropriate usage of a term is itself not seen as a trivial task but rather one that has metaphysical significance regarding the way we think about and understand concepts (the present authors have expanded upon this approach elsewhere – see for example Standish 2012, and Williams 2014). The inheritance of this procedure in this chapter is not out of place, given Ordinary Language Philosophy profoundly influences Hacker’s own philosophy.

[3] Hacker, given his philosophical allegiances, may well probably dispute the comparison with Nietzsche.

[4] It is perhaps worth emphasizing here that neuroscience – conceived as it is as an approach informed by materialism and physicalism – in many ways styles itself as offering a polar opposite account of the mind to that presented by Descartes (and those who inherited his account), which has been charged with turning the mind into a non-material, 'ghost in the machine.' However, as Hacker has argued elsewhere, neuroscientific accounts of the mind – alongside modern philosophy of mind which attempts to 'hang on the white coat-tails' of contemporary neuroscience – does not, in fact, succeed in overcoming the Cartesian-based picture so easily. For, the picture of the mind that is established by what Hacker terms the "consciousness community" continues to rest on what he identifies as a "thoroughgoing confusion" – which has resulted both from the knots that have been tied in language and the inherited Cartesian mystifications (most notably, that 'consciousness' represents an inner, subjective world) that neuroscience continues to labor under. For more details see Hacker 2012.

[5] Although, it is perhaps worth noting that Hacker's reading of Wittgenstein may well be more conservative than the account we develop in the following sections.

[6] Of course, this is also the rationale behind Wittgenstein's "Private Language Argument," which shows the impossibility of having a private language, given since words get their meaning from the way they are used by communities.

[7] As Charles Taylor puts it, the map of a terrain relates all points to each other "without discrimination," for it lays everything out "simultaneously" (1997, 176)

[8] What we are suggesting here is brought out in Heidegger's later account of the "poetic" nature of language, which should not, of course, be misinterpreted as a romanticized valorization of poetry, but rather is suggestive of the way that language has the potential for creating new possibilities and thoughts, and that this fundamental quality of language is perhaps most clearly evident in poetic writings (see Heidegger 1971 [1959]). Furthermore, it invokes the notion of the "iterability" of the sign – its ability to be repeated and re-used in new and different ways, which Jacques Derrida emphasizes in his account of the functioning of language. For more on this see Williams (2014).

[9] Children see their parents washing vegetables and cooking them. They are given a toy vegetable set and duly wash the plastic vegetables. They will not eat the plastic vegetables: the nature of the activity is that they are self-consciously following the rule adopted by their parents (i.e., wash vegetables before cooking). For elaboration of this point, see Standish 2015b.

[10] Rhees writes: "When he can speak, we may be delighted because 'He can say things himself now—not just repeat.' But what is important is that he can *say* things: not just that he can construct new sentences—as it were in an exercise. You can set him exercises if you want to test his vocabulary. But this is not how you find out whether he can speak. . . The point, roughly, is that if he can speak he has got

something to tell you or to ask you. In arithmetic it is different. ‘Telling you things’ is not part of his achievement when he learns to multiply, whereas it is his principal achievement in learning to speak” (Rhees 2006, 159). For further discussion, see Standish, 2015a.

[11] See for example Williams (2015) and Standish (1992).