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# On the powers of powerful knowledge

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**Abstract** The aim of this paper is to explore and clarify the idea of 'powerful knowledge' as a sociological concept and as a curriculum principle. The paper seeks to clarify its conceptual basis and to make its meaning and the arguments it implies, less ambiguous and less open to misunderstanding. This will enable us to suggest some of the research and policy options that it opens up. The paper begins with a brief discussion of the origins of the contemporary usage of the concept in the sociology of education and its explains its roots in the often neglected sociology of knowledge of Emile Durkheim. We draw from Durkheim the idea that 'powerful knowledge' is differentiated and specialised knowledge and trace this argument through the work of Vygotsky and, in more detail, of Basil Bernstein. Following Bernstein's analysis of the different forms that specialised knowledge can take, we consider the curriculum implications of the view that some forms, the STEM(Science, Technology, Engineering and Mathematics) subjects, are 'intrinsically more powerful than others'. We indicate the limits of this argument and in the final section suggest how the idea of powerful knowledge can be more broadly conceived to include the arts and humanities.

## Introduction: knowledge in question

The primary aim of this paper is to make a positive case for the idea of 'powerful knowledge' (Young, 2009, 2013) as a sociological concept and as a curriculum principle. We seek to clarify its conceptual bases and to make its meaning, and the arguments it implies, less ambiguous and less open to misunderstanding. This will enable us to suggest some of the research and policy options that it opens up.

It is an appropriate time for such a task as the concept has been called on in a growing number of academic, practitioner and policy contexts in England and elsewhere. In academic contexts it has become the subject of sometimes-acrimonious debate. Amongst philosophers, it has been discussed unfavourably by some (White, 2012) and though less directly, favourably by others (Cigman, 2012). In recent papers (Beck, 2012) John Beck, so far the only sociologist who has commented directly on the concept, raises a number of related issues that we only touch on in this paper. The concept has been favourably drawn on by researchers in the teaching of history and geography (Counsell, 2011; Firth, 2011), among teachers in a number of broader-based fora[1] and in academic contexts in a number of countries outside the UK—in particular New Zealand, Australia, South Africa and Portugal. In policy contexts, it has been acknowledged as influential by the Expert Panel of the English *National*

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*Curriculum Review* Department of Education (2011) and by the South African Review Task Team of the *National Curriculum Statement* Department of Basic Education (2009).

In this paper we begin by make some brief comments about the specific origins of the contemporary usage of the concept from our perspective. We make this proviso because the two words 'power' and 'knowledge' are too general, too evocative, and open to too many diverse meanings for them not to have been used together in other ways and at other times. The concept, as recently used, has its origins in the history of our discipline—the sociology of education—and in changes in the way some of those in the discipline have approached the curriculum and the question of knowledge. However, it is not, we shall argue, a narrowly discipline-specific concept. It is best understood as derived from what, despite its older roots, is a relatively new way of thinking sociologically about knowledge (Collins, 1998) and stands in contrast to more traditional sociologies of knowledge which have tended to associate the sociality of knowledge with bias. More specifically, it has focused on the social basis of academic disciplines, subjects and the curriculum itself, that are found in schools, vocational and technical colleges, as well as universities and programmes of professional education (see Moore, 2007; Wheelahan, 2007, 2010; Young, 2008a,b; Muller, 2009; Case, 2011; Rata, 2011, in press; Beck, 2012). It emphasises how the sociality of knowledge underpins its emergent 'objective' character and thus avoids slipping into the relativism that had plagued many other sociological approaches to knowledge.

The idea of 'powerful knowledge' owes a primary debt to the French sociologist Emile Durkheim, probably the first sociologist of education, and his assumption that we are not only 'social' beings but also—and which is for Durkheim the same thing—'differentiating' and 'classifying' beings. In particular, we not only differentiate our knowledge from the world of which we have experience, but we differentiate within knowledge as well. That knowledge is social for Durkheim meant that it takes its meanings from us as social beings in identifiable and challengeable ways, but in ways that are quite unlike those associated with our everyday experience and opinions.

We also differentiate knowledge from our opinions and experience because it explicitly recognises, even if we do not always know how or why, a relationship to a reality that is independent of us. Quantum theory is the most reliable theory of the physical world there has ever been and in that sense it is as near as we have got to physical reality. At the same time physicists do not know quite why it gives us such reliable predictions. Physics, like any powerful knowledge, pre-supposes that the natural world is real and that current knowledge is the nearest we get to what that reality is. At the same time, quantum theory is probably the knowledge most at odds with our everyday understanding: it tells us that that the particles that constitute matter are in many places at the same time and that matter takes the form of both a particle and a wave.

We differentiate knowledge because in important ways not all knowledge is the same. We differentiate knowledge according to the best way we have to date of representing the differentiation of reality. We intuitively feel that some knowledges are 'better'—epistemically, morally or aesthetically—than others, and that they represent

criteria about what is true, what is beautiful and how we should treat our fellow human beings and the non-human world that are more universal than others. If we accept the fundamental human rights principle that human beings should be treated equally, it follows that any curriculum should be based on an entitlement to this knowledge.

The second lesson we derive from Durkheim is that like all human progress, better ways of knowing are always associated with specialisation, with the intellectual division of labour, and its relationship with the social division of work and occupations. Powerful knowledge therefore is specialised knowledge, whether it is quantum theory or Tolstoy's novels, although not all specialised knowledge is powerful knowledge in the sense we are using power, as examples like scientology indicate. But such examples are easy, and it is to deal with more difficult cases that we need as clear and rigorous a set of criteria as possible with which to decide which knowledge deserves a place in the curriculum on the basis of this argument.[2]

Our argument is not that specialised knowledge has a higher cultural value than non-specialised knowledge. Specialisation is not a basis for denying respect or value to non-specialist common sense knowledge that people draw on in their daily lives. Specialist knowledge is 'powerless' in enabling someone to find their way about a house or city with which they are unfamiliar or helping a friend who has lost a child. The difference between specialised and non-specialised knowledge is a difference of purpose and, as we will argue, a difference of structure; it is not a difference of value, except in relation to those purposes. A community healer's 'knowledge' has human value as part of its wider culture, but for the purpose of treating HIV/AIDS, it is hardly dependable.

Thirdly, to produce new specialised knowledge requires specialist institutions like universities and research institutes. To transmit such knowledge to the next generation also requires specialist institutions. These may be universities, colleges or schools. Specialised knowledge is not acquired or produced informally as part of people's every day lives. Hence the crucial link between the entitlement to 'powerful knowledge', the curriculum and the universal right to schooling. Only if you do not think there is 'better knowledge' that all have a right to, would the principle of social justice reject the entitlement to specialised powerful knowledge through the curriculum.

Why then is there opposition to the idea of powerful knowledge as a curriculum principle? Let us start with the word 'powerful' and its strong association with the idea of 'power of someone over something or someone'. This takes us directly to one objection to powerful knowledge; it can be seen as fundamentally un-democratic, in two senses. In the first sense, powerful knowledge as we have described it, is never distributed to all in an egalitarian manner. This is itself a consequence of specialisation; not everyone can be equally specialised in all things, even though everyone can, at least in principle, be offered access to the basic powerful knowledge deemed critical for responsible citizenship in a society. Powerful knowledge is not only distributed unequally, but those who tend to get it are generally those already privileged—'in power' in this sense. This has led in turn to a conflation of the two senses of power, a conflation that is not only a category mistake but also one that has had tragic consequences. The 'Lysenko affair' in the Soviet Union,

when Stalin ordered the yield of crops to be improved, is one such (Lecourt, 1976; Young, 2008b). Another is the 'Mbeki affair', which refers to the South African state's refusal to distribute anti-retroviral medication to AIDS sufferers on the grounds that the then President Mbeki had decided that it was 'poison' (Weinel, 2007).

This argument is supported by the specific way in which science, technology, engineering and mathematics (STEM) subjects have come to be seen by governments as compulsory for a curriculum based on powerful knowledge, even though they may not refer to the concept itself. There is no question that STEM subjects provide the most successful ways of transforming, predicting and controlling aspects of the material world, even if they do not always predict the unintended consequences of such transformations. This explains the increasing emphasis put on STEM subjects by governments at the expense of subjects that do not seem to offer as much in terms of control over either the physical or the human environment.

Are STEM subjects then the only exemplars of powerful knowledge? Perhaps to avoid this conclusion, some philosophers argue that schools should not make knowledge acquisition their primary goal but should treat schools more as families, cities or communities—that is, with the goal of maximising human well being (White, 2012; Reiss & White, 2013). Only if knowledge, whether from the sciences or humanities, contributes to human well being, they argue, should it be included in the curriculum. Plausible as this may seem, the supporters of well being or happiness rather than knowledge as a curriculum goal end up with an instrumental view which polarises knowledge and well being and denies the idea that knowledge may have intrinsic worth; it assumes that somehow well being can be separated from the mastery of knowledge (Cigman, 2012).

Is there a broader definition of power than that associated with STEM subjects? A historical viewpoint is instructive. The STEM subjects are relative newcomers to the canon and the curriculum in universities and schools. After the theological domination of the universities began to wane from the late Middle Ages in Europe, it was the humanities as expressions of elite culture that dominated the school and university curriculum, culminating in the Arnoldian definition of liberal education as involving 'the best which has been thought and said'. This expressed the humanitarian ideal of the cultivated citizen in the nineteenth century and was followed by similar ideas expressed by T. S. Eliot and F. R. Leavis. However, the balance had already begun to shift away from the humanities to the sciences after the beginning of the Scientific Revolution in the eighteenth century when the maturing sciences broke free from speculative (Aristotelian) philosophy and 'trial and error tinkering' as the main way to establish bodies of knowledge with conceptual and theoretical depth and empirical warrant (Collins, 1998).

There are two ways of seeing this shift towards STEM-based powerful knowledge from the 'worthwhile' knowledge of the humanists—a contemporary parallel of the earlier shift from Trivium to that of the Quadrivium (Durkheim, 1977; Bernstein, 2000; Muller, 2009). One is as a form of democratisation of the curriculum. If STEM subjects are the nearest we can get to universal knowledge (for example, physics is the same everywhere), it could be argued that they are in principle 'democratic' in that they do not rest on the cultural assumptions of any particular group but only the

reliability and objectivity of their concepts and methods. By contrast, the humanities rely largely on traditions. To put it another way, the humanities represent the cultural 'knowledge of the powerful' (Young, 2008a) in a world where such knowledge compares less and less favourably, on universal criteria, with STEM subjects. It is easy to see how, by raising the very question of specialisation and powerful knowledge, one can end up with a view of non-STEM subjects as less than powerful, and hence less and less deserving of space in the contemporary curriculum and less worthy of support from public funds.

We will counter this view later in this paper. In this introduction, we have set out to argue that there are three distinctions essential to an understanding of what we have referred to as 'powerful knowledge'; and why it might be a useful concept for the purposes we set out at the beginning. The three distinctions are cumulative; that is, each depends on the one(s) prior to it. They are:

- The distinction between 'knowledge of the powerful', and 'powerful knowledge'.
- The distinction between non-specialised knowledge and specialised knowledge.
- The distinction between specialised powerful knowledge and specialised less powerful knowledge.

We have touched on all three in this introduction. The first distinction reminds us of the difference between two questions we might ask about knowledge and the curriculum; who decides what counts as knowledge and why? And what can any form of knowledge do for those who have access to it (Young, 2009)? Although, in its initial formulation, and as Beck (2012) makes clear, 'powerful knowledge' and 'knowledge of the powerful' were presented as a dyad, it is the former concept that has raised the ire of the philosopher, John White (White, 2012),[3] and been picked up in curriculum as well as sociological debates. In what follows, therefore, we will concentrate on the latter two distinctions, examining more closely the possible sociological grounds for distinguishing first between knowledge proper and other forms of belief; and secondly, between possible grounds for distinguishing between the degrees and types of power associated with different forms of specialised knowledge. In this way we hope to focus more and more directly on the title of our paper—the power (and powers) of powerful knowledge.

## Two exemplary theorists of specialised knowledge: Durkheim and Vygotsky

There are two exemplary accounts of why it is important, especially for those directly involved in education, to draw a distinction between kinds of knowledge, and why this distinction is crucial to distinguishing between specialised forms of knowledge and the other kind of knowledge that we all make use of in our daily lives. They approach the problem in different ways, but each succeeds in establishing a socio-epistemic rationale for specialised knowledge.

### Emile Durkheim (1858–1917)[4]

The importance that Durkheim gave to differentiating between knowledge and experience can be traced back to his criticisms of Kant in his doctoral thesis, which later

became his first book *The division of labour in society* (Durkheim, 1993). He developed his alternative to what he saw as Kant's 'transcendentalism' with his concepts 'sacred' and 'profane' that arose from his research into the religions of primitive societies in his book *The elementary forms of religious life* (Durkheim, 1995) that was published towards the end of his life. Durkheim initially used the sacred/profane distinction to describe the separation of religion and everyday life that he found in the societies he studied. He noticed these two quite distinct ways of thinking and forms of social organisation described in the ethnographies of the time. Furthermore, as he was looking for the most general characteristics of all societies, the distinction became, for him, a basic social and conceptual form of differentiation at the heart of all societies, even those like the France of his time that had become largely secularised. He saw the difference as referring to two systems of symbolic meaning and argued that in their initial attention to the 'after life' and the 'problems of survival in everyday life' they were the precursor of the later differentiation between 'theory' and 'practice' that became the basis for the development of science and all forms of intellectual speculation in modern societies. For this reason he referred to the examples of the sacred that he found in the religions of primitive societies as 'proto-sciences'.

Thus, Durkheim argued that the conceptual and social differentiation of the everyday world of survival (the profane) from the totemic systems which allowed people in primitive societies to speculate about the afterlife (the sacred) became the social basis of science and other forms of knowledge that could be developed free from the exigencies of everyday contexts and problems. Without this separation, he argued, no society as we know it, and no social progress, would have been possible. In contemporary terms, his 'profane' and 'sacred' categories provided the social basis for separating practical and everyday problems from the theoretical/intellectual/conceptual problems that historically became secularised to include science and other forms of intellectual activity. Hence Durkheim offers an account of the specialisation not only of occupations but also of knowledge itself. It is of course a very different account from that offered by Marx. Whereas for Marx philosophy should become a philosophy of praxis or action, for Durkheim the knowledge that we need as a basis for understanding the world and therefore the possibility of changing it, is separate from and prior to the practical activities of people's everyday lives. Given that Marx relied on the practical business activities of his friend Engels to give him time for his theoretical activities in writing *Capital*, it could be argued, that in this respect at least, Durkheim had the better theory!

What Durkheim offers us is a sociological account of the development of knowledge and how it progresses. The conditions for knowledge to be reliable have to be *a priori* not *a posteriori* to its development. For Durkheim, to rely on usage or, in modern terms 'whether something works', opens the door to relativism. After all, what happens if an idea turns out 'not to work'? We don't know why and we have no principles for envisaging alternatives. In *Pragmatism and sociology* (1983), that we referred to earlier, Durkheim's target was the American pragmatist William James (1970) and to a lesser extent the young John Dewey (1908) who much influenced the leading French philosopher of the time, Henri Bergson. In some ways the early pragmatists were not so different from today's constructivists; their claim was that something was true 'if it

fitted with experience' or 'was useful'. He saw these ideas as undermining the conditions for the trust in, and the growth of, science and consequently the possibilities of a fairer society.[5]

There are two strands of Durkheim's work that are important for our argument about 'powerful knowledge'. The first arises from his criticism of Kant's idea that we rely on knowledge that is *apriori*. This meant for Kant that the foundation of knowledge was either 'in the mind' or in some transcendental realm. For Durkheim the only solid foundations for knowledge were those rooted in reality and for him that reality was social. The second issue that Durkheim focused on was specialisation both in the occupational structure and in the growth of knowledge—both as aspects of changes in the division of labour. This raised the question that was at the heart of his sociology and beyond the scope of this paper: how do societies based on specialisation hold together and not fragment? In his later works he began to explore possible solutions through the role of education and the growth of professions as 'mediators' of specialised knowledge.

## Lev Vygotsky (1896–1934)

Vygotsky's short career began shortly after Durkheim died, in 1917 (at the beginning of the Soviet Revolution) with the publication of his essay on Shakespeare's Hamlet and his critique of the dominance of behaviourism in the psychology of his time. However, he soon began to focus on the problems facing teachers in the new society in which the autocratic culture of Tsarism was still dominant, where few teachers were trained, and when schools for all were only just being established. The idea of specialisation or the differentiation of knowledge from experience arose from his theory of human development as a cultural process and his belief that all people had a right to, and a potential for, developing higher order thinking that they would not have access to except through attending school.

Like Durkheim, Vygotsky relied on a binary distinction although not in the way it has often been understood by psychologists (see Derry, 2008). His distinction was between two kinds of concepts—theoretical (or scientific) and everyday (or common sense). As concepts, they have some remarkable similarities to Durkheim's 'sacred' and 'profane' although Vygotsky gave them a very different significance. The task of the curriculum, and schooling more generally, for Vygotsky, was to provide students with access to theoretical concepts in all their different forms from history and literature to the sciences and mathematics. Furthermore, he saw that access to higher order concepts was a complex two-way pedagogic process. Initially, the learner's everyday concepts are extended and transformed by pedagogy through engaging with the theoretical concepts of the curriculum. The process is then reversed; learners draw on their newly acquired theoretical concepts to re-engage with and transform their everyday concepts. Differentiating theoretical knowledge from experience was therefore central to his concept of pedagogy in ways barely touched on by Durkheim.

These two thinkers, despite their limitations, help us to establish the distinction between specialised and non-specialised forms of knowledge as a basis for the curriculum (from Durkheim) and pedagogy (from Vygotsky). We now turn to an analysis of

some properties of specialised knowledge. It will soon become evident that specialised knowledge takes various forms.

## Some properties of specialised knowledge

In an earlier paper, one of us (Young, 2009) drew from Rob Moore (2007) four principal properties of what in this paper we are referring to as 'powerful knowledge'. It will be evident that different disciplines display these properties in differing respects. Nevertheless, in each of them, specialised knowledge differs in a significant way from what we have called non-specialised knowledge (for example, topical and everyday problems and themes):

*Specialised knowledge is systematically revisable.* In order for revisions to take place in a systematic and accountable way, there has to be a robust and generally agreed-upon way to distinguish the best proposition from other likely contenders. Disciplinary fields or traditions develop criteria over time which allow their disciplinary community to arrive, with a greater or lesser degree of consensus, at a judgement of this 'bestness', or the nearest we have to truth at any time. Even disciplinary communities that are characterised by sharp disagreements about the criteria for judging 'bestness' can still usually judge innovations in their disciplines with a considerable degree of agreement (Muller, 2010). This is a mark of all specialised forms on knowledge.

Different criteria of 'bestness' have been differentially influential over the ages. The criterion we normally take as dominant today is the epistemic tradition of 'bestness' associated with explanations in the natural sciences. Since Popper and Lakatos (both in Lakatos & Musgrave, 1970), epistemic 'bestness' distinguishes truth from non-truth in a revisable, non-absolute manner. Two other traditions have, however, been dominant in their turn, and continue to operate in the contemporary academy. The first, and the first that was historically hegemonic in the academy, was the moral or religious tradition of revealed truth. In the ancient European universities Aristotelian philosophy cohabited and prospered alongside theology. But theology was taken as the undisputed key to the intelligibility of man and the universe, hence the priority of the Trivium (the disciplines of the mind and the spirit—the nascent humanities) over the Quadrivium (the nascent sciences of the natural world) (Durkheim, 1977). More recent although certainly less hegemonic versions of this tradition are found in Newman's famous statement on universities (1996) and in MacIntyre's recent writings (1981).

In the Middle Ages, at least in Europe, aspects theology were gradually naturalised humanised and secularised, and an aesthetic humanism came to rule the criteria for 'bestness'. Only with the Scientific Revolution, from the seventeenth century onward, did epistemic criteria begin to trump ethical and aesthetic criteria and a regulatory concept of truth came to replace an absolutist concept based on revelation. The principal ethical and aesthetic disciplines are of course an integral part of the contemporary academy, but seen through an epistemic lens, they have come under attack for not meeting two key epistemic virtues: firstly, they do not constitute what Turner (2011) following Collingwood (1993) calls 'compulsive proof'; and, secondly, even in terms of their own criteria of 'bestness', ethical or aesthetic judgments do not have the same 'basis for agreement and reliability as epistemic judgments.

We will return to interrogate these charges more closely later in the paper. We would like to make two points to conclude this section. First, on the primary charge that the humanities and social sciences do not satisfactorily fulfil natural scientific criteria of epistemic 'bestness', we will argue, that it is based on a category mistake. Irreducible sets of robustness criteria—epistemic, ethical and aesthetic—have always contested for dominance in the academy as we saw above. Each has had its day of dominance. This should not mean that their natural disciplinary carriers should fall from favour simply because one set dominates at any given historical moment. This is to throw the baby out with the bathwater, which is to say, it risks evicting certain forms of powerful knowledge from consideration simply because they do not conform to the currently dominant definition of criterial robustness.

*Specialised knowledge is emergent*

This means two things. One is that specialised knowledge is produced by social conditions and contexts but cannot be reduced to them. The originating contexts may leave their mark on the knowledge; what kind of a mark and how significant the mark can be disputed. However, the value of the knowledge is *independent* of these originary contexts and their agents. If it is not, if knowledge remains 'contextual', then specialisation and therefore the reliability and (and in the sense we have used the term up to now) the 'power' of the knowledge will in a determinable sense remain limited.[6] The human and social sciences are in a certain sense more 'contextual' than the natural sciences. But even here there is 'emergence' from context such that social knowledge, in order to become knowledge, must meet the criterial rules for acceptability of the discipline concerned. Even if these rules or norms are contextually sensitive, they are themselves not contextual, or else they will not be able to function as disciplinary norms.[7] It is then these social norms, not the particularities of the context or the interests or peculiarities of the agents that govern the judgment of knowledge as both specialised and reliable (Weber in Whimster, 2003).

There is a second meaning of 'emergence' that has a particular significance for the social sciences, which was first articulated by Durkheim. Although social events such as crowds, strikes, riots and institutions are constituted by the actions of individuals, Durkheim argued that such events have a 'social' reality that we can have knowledge of that is not reducible to the actions of individuals. This was the burden of Durkheim's argument in his famous study of that most individual of acts, suicide.

There is a position in the philosophy of the human and social sciences which argues that no knowledge, even natural scientific knowledge, can emerge as fully independent from its context, and that all knowledge is in some sense contextual, reducible to its context and the agents of its production (for example Haslanger, 2008). This is an argument *against* the distinction between specialised and non-specialised knowledge that we have drawn on. We would just note that the sense in which knowledge might be claimed to be 'contextual' in physics has a very precise, limited and measurable meaning[8]. which hardly warrants the description 'contextual' and is very different from the meaning of same word when it is applied to knowledge in the social or human sciences. We can therefore disregard this claim and focus on the degree of 'contextuality' of concepts in the social sciences.

*We argue that specialised knowledge is real*

It is about something other than itself about which it says something in a robustly reliable way (see the revisability criterion above). Ever since the Scientific Revolution, the test of this reality has been whether 'the world' answers to knowledge claims. However, all too often this is taken to mean that all specialised knowledge is knowledge about natural kinds—that is, knowledge about nature. From the writing of Giambattista Vico in the sixteenth century, through the German *methodenstreit* debates[9] the argument of some about the human and social sciences has been that they represent knowledge about cultural or social kinds (phenomena), not natural kinds (phenomena). The debate has revolved about whether knowledge about cultural kinds can indeed be emergent—separable from context—or whether it can only become reflexively—that is partly—distanced from it (Bourdieu, 2004). The debate is not settled. Conceding that the human and social sciences are about cultural kinds, however, does not mean that that they cannot be objective, nor that the worlds that they provide an account of are not real.

*Specialised knowledge is material and social*

All specialised knowledge is produced in particular socio-epistemic formations. These have traditionally taken the form of disciplines which are located mostly, but not only, in universities, with particular rules of formation or, as Durkheim would express it, with their own internal rules of solidarity, hierarchy, and truth norms. Disciplines differ in terms of their internal material cultures (their 'cultural styles' in Becher's (1994) terms). It is this material culture that holds in place the criterial or disciplinary norms (Becher's 'cognitive styles') constitutive of specialised knowledge.

From the above analysis an argument has begun to emerge about different forms of specialised knowledge, and hence of different forms of powerful knowledge. Nevertheless, there is one line of argument from the above that could lead to the conclusion that some forms of specialised knowledge are intrinsically less powerful than other forms, and hence may be less deserving of curricular inclusion. We take this argument very seriously, and present it in the section that follows, before we go on to indicate its limits, and ways in which powerful knowledge can be more broadly and inclusively considered.

## Theoretical progression and empirical confirmation as criteria for powerful knowledge: the view from 'Bleak House'

The strongest post-Durkheimian account in the sociology of knowledge is that of Basil Bernstein (2000), and much of the on-going work in the sociology of education derives directly or indirectly from this quarter. This work attempts to flesh out the variations of specialised knowledge and their implications for curricular transmission (see Hoadley & Muller, 2010, for a recent review). There are two principal criteria for differentiating forms of specialised knowledge that can be drawn from Bernstein's work:

*Differences in the internal relations of the knowledge*

This criterion describes two typical ways in which the internal relations of the knowledge—the body of theory or groups of concepts and methods derived from them—hang together.

- The first is that they build *cumulatively and progressively*, with earlier formulations being subsumed by later formulations. Bernstein called this form a *hierarchical* knowledge structure, in terms of which different knowledge structures and their bodies of theory differ in terms of their degrees of *verticality* (Muller, 2007). This clearly describes the family of the natural sciences and in a slightly different way is expressed more broadly by one of Vygotsky's successors V. V. Davidov (see Gamble, 2011; Young, 2012).
- The second typical form is that the internal relations—theories and relations between sets of concepts—accrue not by one subsuming the other, but by the *addition of parallel theories* (languages, or sets of concepts), or in Bernstein's terms, *horizontally*. These parallel languages (bearing in mind that variants like historical narrative also belong here) co-exist uncomfortably but necessarily, because the unavoidable context-boundedness of their concepts limits inter-translatability and hence their epistemic guarantees. This clearly describes many of the social sciences and, somewhat more ambiguously and in some cases in different ways, the humanities.

It is not hard to see why the more subsumptive[10] theoretical disciplines are regarded as powerful. Setting aside the power of their utilitarian applications for the moment—certainly not an inconsiderable power—Weber thought this was the defining feature of modernity. He argued that those theoretical edifices which rested upon a deep base of accepted knowledge have a projective capacity that augments the capacity of scientists to imagine the previously unimaginable, and to think the previously un-thought (see in Whimster, 2003). This is the power of theory in its non-utilitarian aspect, which is not to say that in some cases, such imaginative thinking does not develop practical uses.[11] Yet the question we pose below will be whether theories that do not take this subsumptive or vertical form cannot also have imaginative power, and provide the capacity for thinking the un-thought, albeit in very different ways and perhaps of the kind associated with great art in all its forms (Rosen, 2012).

The idea of verticality as a descriptor of knowledge for the curriculum has led to fruitful investigations which have been able to show that curricular subjects with different degrees of verticality require specific kinds of curricular sequencing and pacing to optimise their pedagogic transmission for all learners, but especially those from poor and less privileged households (Reeves & Muller, 2005; Hoadley, 2011).

Nevertheless, there are assumptions embedded in the criterion of verticality that bear closer scrutiny. The first is that Bernstein explicitly distinguished between two distinct knowledge *structures* of vertical (that is, specialised) discourse, hierarchical and horizontal. He is not further explicit about why he does this, but he can be read to be saying that these forms of knowledge structure are not reducible to one another; in other words that they are in principal formally distinct. Tantalisingly, he never spelt

out what distinguished them, beyond the distinctions already made above. If this reading of Bernstein has merit, and we will argue below that it has, then the nominalisation of *verticality* could lead to the conclusion that all knowledge structures, hierarchical or horizontal, can be ranked in terms of their degree of verticality, leading unwittingly to a reductive reading of kinds of knowledge structure, and ineluctably to a view of the horizontal family of knowledge structures as deficit hierarchical knowledges. It is this construal that leads to what we term the Bleak House view. We will return to a potentially non-reductive reading of Bernstein below.

*Differences in the external relations of the knowledge*

This criterion describes a capacity of the theory to describe, stably and reliably, something other than itself—an aspect of the natural or social world. Bernstein referred to knowledge forms as having strong or weak grammars, and once again, the nominalisation of *grammaticality* (Muller, 2007) can be read to suggest that all knowledges have either strong or weak grammars. A more nuanced reading of Bernstein will show that he meant 'grammar' to refer only to horizontal knowledge structures (Bernstein, 2000, p. 168). Hierarchical knowledge structures do not have 'grammars' separate from their theories, at least not their accepted theories. What is subsumed in a hierarchical knowledge structure is a set of propositions governing the precise description of a range of phenomena. There can be no degrees of grammaticality here; either the proposition is or is not disconfirmed. Of course these propositions can be revised, but they will be revised from a relatively stable base of accepted propositions, and they will not be revised until an equally or more precise proposition is accepted. In other words, knowledge in hierarchical knowledge structures has a reality that is not separable from the phenomena it explains at least in terms of the current state of the discipline concerned.

Take the case of heat. *Hot* as a category horizontal discourse is located in the everyday. It does have a separate grammar, based loosely on experience. But heat is part of a hierarchical knowledge structure (a theory of heat) and its grammar and instruments (the thermometer) are integral to its meaning. It is not that horizontal knowledge structures do not have discursive external relations; rather, it is that in hierarchical structures the external and internal relations are not separated.

The grammaticality issue only arises in cases when theory is weak, where integration is not possible, as is the case in the social sciences, in some borderline sciences such as parts of epidemiology and when as in the case of neuroscience, some researchers attempt to extend the remit of the concepts beyond the capacities of the theory. Once again, why some theories are inescapably weak is not very clearly addressed by Bernstein, and we will return to this again below.

The reading of Bernstein given here suggests then that a certain use of his distinctions can lead to what we have called a reductive view of knowledge forms. If 'verticality' and 'grammaticality' are read as qualities of all specialised knowledge forms, albeit to varying degrees, then the distinction between hierarchical and horizontal knowledge structures collapses. The logical consequence of this reduction is that horizontal knowledge structures, primarily found in the social sciences, are seen as deficit hierarchical knowledges, or deficit natural sciences. This reading is powerfully

abetted by a reductive move on the social sciences from another direction as well, derived from the explosion in cognitive neuroscience (Turner, 2007) that has been driven by new observational technologies like fMRI scans. This intellectual movement implies that the social sciences are indeed nascent 'immature' natural sciences and that their future as 'real' sciences depends entirely on further developments in neuroscience. Our argument, in concert with our reading of Bernstein, some neuroscientists (Tallis, 2011) and philosophers (Bakhurst, 2012), and traced back again to Durkheim, seeks to recover the specificity of the social sciences and humanities and thereby their distinctive senses of power.

## Beyond naturalism?

How then are the human and social sciences different from the natural sciences? The question has traditionally been seen as 'the problem of other minds'. What the social sciences study is not a chunk of inert (Laugier, 2013). Rather, the social sciences study subjects that are *minded* (McDowell, 2007), with their own intentions and understandings of the situation at hand. We can observe what they do, but we cannot directly observe the meanings they attach to those actions; we can only infer them. This is particularly the case for understanding actions in the past, but it also pertains to actions in the present, even when we are in a position to ask the actors. This argument was canonised in Weber's famous distinction between *direct* understanding (or *verstehen* in German), which has come to mean understanding from the actor's point of view; and *causal* or indirect understanding, which requires a rational reconstruction, evidence and a process of inference[12] (in Whimster, 2003, pp. 315, 316; see also Turner, 2011, pp. 246, 247). It is this indirect or interpretive inference and the relationship between the two kinds of inference that that has become a bone of contention and underlies at least some of the issues in the debate about powerful knowledge and the curriculum.

In the early to middle decades of the twentieth century the 'problem of other minds' was brought home forcefully to the social scientific community from at least three different directions. The first was the collapse of behaviourism as an explanatory theory that had tried to ignore the meanings of social subjects.[13] This was paired with an increasingly ferocious attack on 'positivism' that continues unabated today. The second arose from the difficulties experienced by anthropologists from colonial countries in their imperial task of trying to 'understand' the subjugated populations of the European empires that were then on their last legs (see for example Kuper, 2005).[14] Thirdly, as the century wore on, a series of social movements fed into a growing confluence: to name but a few—anti-colonial struggles and the emergence of an assertive Third World; the eventual success of the civil rights movement in the US; the student revolts in Europe and elsewhere; the emergence of 'youth', gender and ethnicity as significant new social categories, peaking in the counter-cultural movement of the hippies in the 1960s and 1970s. A ubiquitous anti-authoritarianism was in the air, what Geoff Whitty presciently called 'naïve possibilitarianism' (Whitty, 1974). It is no accident that sociology of education's own mini-movement to 'make it new' (modernism's battle cry) was dubbed the 'new sociology of education', no accident either that it prominently featured a forthright anti-positivism and a experiential empathy

with 'other minds' via an adoptive phenomenology from Schutz and Merleau-Ponty (see *inter alia* Young, 1973).

All of these movements had in common, albeit often only implicitly, a particular reading of Kant (Turner, 2011). For Kant, understanding always involved 'presuppositions' on the part of the one doing the understanding; the understander always brought to the act of understanding a presuppositional surplus that underlay and ultimately shaped understanding. We return, therefore in a slightly different way to Durkheim's issue with Kant referred to earlier in this paper. The question was; wherein did this surplus consist? The intellectual mainstream underlying much of the liberatory anti-establishmentarianism sketched above drew on certain strong currents of neo-Kantianism[15] running from Nietzsche through Heidegger, the German hermeneutists, the American pragmatists and certain kinds of neo-Marxism. Most crucially for the social sciences and how they were appropriated in educational studies, it was through Kuhn's 'paradigms', that 'presuppositions' were to be understood in a non-cognitive or anti-intellectual way, at best as 'culture', at worst as contextual bias or ideology. The resultant 'hermeneutics of suspicion' was precisely that any act of understanding of social activity was constitutively an act of ideological imposition, and often a covert attempt at mastery or 'symbolic violence'. It was taken as read that this ideological contamination was inescapable and could not but permeate the inferences of the social scientific observer or analyst. This constitutive contamination meant not only that social science was seen as a different sort to natural science,[16] but that it masked an attempt at domination that required resistance, where resistance meant valorising the viewpoint of the 'other' and unmasking the interests of social science.

It goes without saying that this non-cognitive surplus would also mean that social science could necessarily only aspire at best to partial truths,[17] because they would always preclude cognitive closure between data and theory, would always hijack 'epistemic finality' (Turner, 2011, p. 231), and thus remain un-objective and open to ideological bias. As Robert Merton, perhaps the most revered of all American sociologists, was to put it, sociology was destined to be a discipline of 'many approaches but few arrivals' (quoted in Turner, 2009).

This 'retreat from the cognitive' (Turner, 2007) always had strong voices standing against it, a 'retreat' we have earlier called 'Future 2' in the context of an analysis of developments in the sociology of education (Young & Muller, 2010). We would like briefly to return to two strong counter-voices discussed earlier, Max Weber and R. G. Collingwood, both of whom, while accepting that social science would always consist in different perspectives, argued nevertheless that sociology and history, respectively, could both be objective and therefore truthful (Turner, 2011).

This claim for objectivity depended for both Weber and Collingwood on a position that held that there were elements of social life and action in the past that could be considered as objectively true and separable from the perspectival entry point of the investigator which was the hidden abode of his or her presuppositions. The value of the perspective, either narrative in the case of history (for Collingwood) or theory (in the case of sociology (for Weber), could then be assessed as to how well it could account for the facts as could be agreed from and across different perspectives. That Weber's explanation of the rise of capitalism and his account of forms of authority

survive and remain credible a century later, albeit not without criticisms, is testament to their objective longevity. As Bernstein might have put it, we might concede that theories or narrative approaches—the different horizontal languages—embed a certain one-sidedness that reflects the situatedness of the investigator without also having to concede either that one-sidedness was all that could be said about the theory or that the facts of the matter were also therefore necessarily biased. Because the perspectives were plural did not mean that the grammaticality—rules for making judgements in terms of them—had to be weak. For both Weber and Collingwood, explanatory theories were detachable from the facts of the matter, necessarily so for any accountable investigation to be able to take place. In his most famous book, *The protestant ethic and the spirit of capitalism*, Weber (2002) argued that we (and we must assume that at that time he meant 'we Europeans and Americans') need to come to terms with the fact that: 'In Western civilisation, and in Western civilisation only, cultural phenomena have appeared which (as we like to think) lie in a line of development having universal significance and validity'.

As Weber liked to say, the thoughts of Caesar do not depend on the questions we ask (Turner, 2011, p. 237). But how do we know that we have got Caesar's thoughts right? Here we see the unfortunate consequences of the 'retreat from the cognitive'. If presuppositions are not detachable to some extent from observational understanding or interpretation, there are no resources left to guide or steer the act of direct understanding, and no one person can be 'better' or 'worse' at it than another. Exit knowledge; exit expertise. With the allocation of presuppositions to bias, there is no cognitive basis left for a tutored or expert observational gaze. That this is untenable can be seen by considering the case of expert professional action. The skilled and knowledgeable surgeon knows where to insert the scalpel both because she has the resource of specialised anatomical and physiological knowledge and because she has a repertoire of practical knowledge she has learnt from experience. So too the expert social scientist learns how to make social scientific inferences by learning the specialised knowledge base of the discipline and learning the observational and interpretive techniques taught by adepts. The actions of both the surgeon and the social scientist are, at some point, policed by a knowledgeable scholarly community through the myriad processes of peer review. What this example makes apparent is that the non-detachability thesis has the effect not only of ideologising all social scientific statements barring presumably the ones unmasking the ideological presuppositions, but more deleteriously, evacuating the possibility not only of expert action (Collins & Evans, 2007; Winch, 2010) but the possibility of specialised knowledge, and hence of powerful knowledge, in the social sciences.

Weber held to the view that presuppositions (value relevance) were—had to be—detachable from scholarly acts (value freedom), but he never provided a conclusive argument for why or how this could happen. His was ultimately a moral position that he located in his account of the professional vocation of the social scientist (Weber, 1958). The approach taken in this paper begins at a slightly different starting point. As we said in the introduction, and went on to elaborate, the distinction between non-specialised and specialised knowledge is absolutely crucial. Brought to bear on this problem, this implies that presuppositions—which predate the specialised scholarly or professional act—consist in non-specialised elements *as well as* in specialised

knowledge elements. Both together form the basis of specialised acts or judgments. It is when pre-predicative specialised knowledge is excluded from consideration that social science can be regarded as irreducibly ideological. If the social sciences are to retrieve their specialisations as the basis of their claims to be a form of powerful knowledge, they have to re-introduce the task implied by Cassirer but interrupted by the Heideggerians—that of 'socializing the epistemic and epistemologizing the social' (Turner, 2012, p. 474). That is another way of expressing what we mean by a socio-epistemic theory of 'powerful knowledge'.

The next question becomes: how to ensure that the non-specialised contaminants do not crowd out the specialised elements, which is where methodological rigour (or grammaticality) is critical; that is, methodological rigour as policed by the relevant peer community. We should admit that it is only relatively recently that some of the social sciences have moderated their previously sceptical and even dismissive attitudes towards peer review (part of the heritage of neo-Kantian anti-intellectualism) and taken the responsible step of tightening up on the importance of ensuring anonymity in patrolling the boundaries of what is and what is not admissible as social science. The social—here, the disciplinary community—returns as an executor and guarantor of professional or disciplinary judgement. The sloppier the peer collective is in patrolling the specialised/ non-specialised boundary, the weaker will be the specialised-ness of the resultant knowledge, and the weaker will be the public trust in the resultant knowledge. It is in this way that society adjudges powerful from less powerful knowledge, not only in the verticality of its parent knowledge corpus.

Where does this leave the distinction between natural and social kinds? It is likely that this distinction will turn out to be a red herring. The problem with dichotomising 'natural' and 'social' kinds lies in the implications that are inevitably conveyed, that 'not natural' means not only 'not determined by physical reality' but, as a consequence, 'not fully rational'. The distinction, in other words, accords specialised knowledge to the 'natural' and consigns the 'social' to non-specialised knowledge, folkways, common sense and ideology. From the 'knowledge' position adopted in this paper, it is not necessary or relevant to make a distinction between 'natural' and 'social' kinds. Besides the reductive freight it carries, attention is distracted away from the kernel of the issue. This is that all specialised knowledge communities have an onus to strengthen their methods, the better to strengthen their attendant theories and the coherence of their concepts.

This in no way denies the differences between the various forms of specialised knowledge that we have discussed. Nor does it claim that some are merely 'immature' versions, which may one day 'catch up', nor deny that the social sciences differ widely in the degree of shared agreement among peers. All these differences reflect the extent to which, as we have expressed it, the relations between specialised and non-specialised knowledge differ in different disciplines. The boundaries between the two are for all practical purposes unbridgeable in physics and in the chemical and, increasingly, in the biological sciences, not the least as a result of the lack of ambiguity of the mathematics they use and the abilities they have developed to express the relationships between their concepts in precise mathematical form. In the social sciences, if we take Cassirer's point about the intrinsic limits to the extent social phenomena are subsumable by concepts, this will never be true. However, despite these differences,

*all* disciplines deal with the world we face which is inescapably both natural and social. The distinction that matters is between those disciplines that, irrespective of their received conceptual reservoirs, are robust enough to gain public trust and those that do not. This is the social heart of powerful knowledge.

## Whither the arts?

We started from the idea that knowledge is 'powerful' because it frees those who have access to it and enables them to envisage alternative and new possibilities. We focused on how this is exemplified by STEM subjects, and, in different but no less important ways, by the social sciences including history. But what about the arts—performing, visual and literary? Are they specialised knowledge in the sense we have discussed the idea? And are they differentiated from everyday experience as we have argued is true of the sciences and social sciences? And if not, are they, as some current funding and curriculum policies in England seem to imply, to be cast into the dustbin of history?

We reject this view. At the same time, we do not claim that specialised 'powerful' knowledges are distinct from everyday experience only in degree. When we conceived of the title of this paper as treating of 'powers' and not just of 'power' in the singular, we explicitly recognised that there are different forms of power associated with different forms of specialised knowledge. The STEM subjects are 'powerful' because they offer predictions and explanations beyond any that are possible for those who have to rely only on everyday thinking. The social sciences inherit some of these features: they provide generalisations that are tied, sometimes only weakly, to specific contexts; they generate facts grounded in the relatively objective methods of their peer communities. Their findings become a resource for debates about alternative policies, and they contribute in some cases to a society's conversations about itself. Furthermore, they make testable predictions, albeit in most cases as probabilities not certainties, and remind policy-makers and politicians that the consequences of their decisions may be more 'powerful' than their intentions. The point we have made is that only if they take their rules of argument and evidence seriously, only if they treat their boundaries between disciplines and between specialised and non-specialised knowledge as sources of greater generative power, and not just as barriers to innovation, will their accounts come to be trusted and not dismissed merely as a set of competing ideologies.

Having made the point about the power of different types of specialised knowledge, we turn briefly to another dimension of 'power', for example, the power to imagine moral and aesthetic alternatives, which do not represent generalisations in the sense we have discussed, but which may be universal in the sense of connecting people to a larger humanity. There is every reason why access to such powers, expressed in literary, visual, musical or kinesthetic forms, should likewise be an entitlement for all. They are specialised and separate from everyday experiences; they are located in specialist communities that define their concepts, rules and practices, and the boundaries that distinguish them, define their objects and provide constraints that can be sources of innovation and creativity. If they share features in common with other forms of powerful knowledge, what are those features and why is it important to distinguish them from forms made popular by the market?

In a recent comment, the music critic Charles Rosen (2012), whose work we referred to briefly earlier, points us in a fruitful direction, although we can do no more than hint at the possibilities here. Rosen reminds us that the arts, while not liberating us completely from conventional meanings, let alone being without conventions themselves, provide a certain freedom from mundane certainties and conventions. What distinguishes arts from the sciences and social sciences is that although they are specialised and subject to the constraints and the boundaries associated with other types of specialised knowledge, they are not exclusive to specialist practitioners. You do not need to play the violin to appreciate Mozart, to write a novel to have read Jane Austen, or to be able to dance to enjoy the Bolshoi Ballet. In each case though it is possible to gain a kind of freedom from everyday melodies, texts and movements, and to imagine an enhanced set of possibilities in each of those domains.

Whereas the sciences speak to the particular from the general, the arts speak to the universal in the particular, and can enable people to feel part of a larger humanity. It is this freedom that Bernstein (2000) is referring to when he argues that disciplines are resources for 'thinking the un-thinkable' and the 'not yet thought'. Rosen reminds us of the links between the innate aesthetic impulses of human beings and the most obvious characteristic of every form of artistic endeavour, that at some point it inevitably draws attention away from its specific meaning and function to the form of expression and hence to the universal. What distinguishes the arts from other forms of 'powerful knowledge' is that although they have conventions, they are explicitly licensed to violate them, 'to entertain, to surprise, to outrage, to be original'. This he says is their inherent subversiveness and why political regimes, especially dictatorial ones, try periodically to repress them.

There is one important similarity with other forms of 'powerful' knowledge that we have discussed. It is that the conventions (or boundaries) of the discipline, for arts and sciences alike, provide the conditions for being able to transcend them. This returns to our initial definition of 'powerful knowledge'—that it is specialised and differentiated from everyday thinking. At the same time we have extended the meaning and range of 'power' from the more obvious predictive powers of the STEM subjects to those subjects and disciplines that are rarely sources of generalisation or prediction but sources of the power to 'shock, outrage, and surprise' and hence transcend the limits in every present. That surely has to be part of any curriculum entitlement.

## Conclusion

It is clear we have not solved all the conundrums that beset the idea of 'powerful knowledge', but we hope to have clarified at least some of them. This is not least because the philosophical community has yet to find a way out of the dead-end of the split between the two traditions of neo-Kantianism represented by Heidegger and Cassirer. Positivism tried and failed, by defining science in a way that no scientist could accept and excluding everything else. Constructivism simply attenuated its relativistic implications.

Other attempts like Latour's 'actor network theory' appeared to solve the problem of relativism but at the expense of losing both knowledge and the social (Turner, 2012). The social realist spirit that we inherit from Durkheim and attempt to re-vivify

here rehabilitates specialised knowledge and binds it back into a social framework on which it depends. We think however that the long shadow of constructivism—an aspect of what we called Future 2 in our earlier paper (Young & Muller, 2010)—will be with us yet for some time, not least because, as John Searle (2009, p. 89) has had occasion to remark, 'People who are convinced by social constructivism typically have a deep metaphysical vision and detailed refutations do not address that vision'. This is a vision of creating the conditions for freedom, which they see threatened by 'objectivity', 'rationality' and 'science'. We too share that vision of freedom, but for us, as we hope to have shown, it is only through the boundaries of the disciplines that genuine freedom, unforeseen expanded possibilities, can be generated. In the meantime, we can but emphasise the importance of powerful specialised knowledge in its diverse forms as the best, and most just, basis for curricular decision-making. Nothing else seems to be on offer.

## NOTES

[1] For example, conferences for head teachers organised by the Prince's Teaching Institute (see Roberts, 2012) and pamphlets published in the Education Forum of the Institute of Ideas.

[2] We need, we will argue, the concept 'powerful knowledge' to distinguish differentiated meanings of the word knowledge; for example, to distinguish knowledge as it is used in everyday conversations (for example, 'He has no knowledge of the city of Tokyo') from the theoretical knowledge of cities associated with the discipline of geography.

[3] Ironically, readers will note that White himself uses a version of the thesis that the curriculum represents 'knowledge of the powerful' in linking the origins of school subjects to the economic interests of the rising Protestant middle class in England in the eighteenth and early nineteenth centuries.

[4] Emile Durkheim was a French sociologist. He was professor of sociology and pedagogy at the University of Bordeaux and at the Sorbonne, now part of the University of Paris. His clearest, though too little known statement of his social theory of knowledge is found in the lectures he gave to future secondary school teachers at the Sorbonne. They were collected and later translated into English as *Pragmatism and sociology* (Durkheim, 1983).

[5] It is important to note that Durkheim's, like Vygotsky's use of ' science', was much more akin to our rigour and objectivity that they saw as a feature of all scholarship, rather than the narrower contemporary view of science as exclusively associated with natural science.

[6] It is on this point that we would differ from Shapin and his famous history of Robert Boyle and the origins of his gas law (1985).

[7] A social norm in the critical rationalism of Canguilhem (1989, 1990) is a regulative principle that produces continuity for grounds of judgment. In this sense, to be a discipline is to be grounded in norms. See also Elder-Vass (2010).

[8] Nearly 400 years since he discovered them, Newton's Laws of Motion hold with very high levels of accuracy except near the speed of light when Einstein's Theory of Relativity applies.

[9] Literally, the 'method wars'. This was essentially a debate between the Austrian School economists and the Historical School historians on the possibility of a science of human action. Under the influence of Rickert, Max Weber joined in the debate. We deal with his substantive contribution below.

[10] We take the idea of subsumptability—the degree to which a phenomenon can be subsumed by the concept (or concepts) of a discipline—from Cassirer (see 1969, 1996, 2000). It is developed more fully by Young and Muller (2007) and Young (2008b).

[11] A good example is how questioning of the assumptions of Euclidean geometry, untested for almost 2000 years, led to previously unimaginable ways of thinking about space which made landing on the moon and sending rockets to the planets possible.

[12] This distinction has been sharpened in the critical realist tradition, which distinguishes between the *actual* (the thing itself); the *empirical* (the experience of the thing); and the *real* (the generative mechanisms that produce the objective and subjective events). See for example Wheelahan (2010) and Collier (1994).

[13] One of the earliest researchers to make this argument was, interestingly, Vygotsky whose influence we referred to earlier and whose work has been so misrepresented as the precursor of Activity Theory (Derry, 2008).

[14] The anthropologists' ideas, however, have survived the demise of empire and another debate has opened up around the value of 'indigenous knowledge' (see Rata, 2011, in press).

[15] There was, of course another neo-Kantian tradition, associated with Ernst Cassirer, which we referred to earlier. Its marginalisation and near demise is perceptively discussed in a recent book by Skidelsky (2008).

[16] Indeed the natural and social sciences were often treated as a 'common enemy' in the arguments for anti-racist, heterosexist and feminist knowledge—the latter neatly skewered by means of a penetrating focus on the materiality of gender inequalities by Martha Nussbaum (Nussbaum, 1999).

[17] In many cases, at least in the 1970's and 1980's, this led some to dismiss the idea of truth altogether. In this regard see Paul Boghossian's (2006) *Fear of knowledge* and Harry Frankfurt's (2005) *On bullshit*.

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