The Nature of Structure: A Neurosociological Approach

Abstract

This chapter considers how developments within the neurosciences might be applied to advance sociologists' (and other social scientists') understanding of social selves and social processes and, importantly, why this might be a fruitful pursuit despite some residual reservations within the discipline. With respect to the latter, the argument presented is firstly approached by briefly reflecting upon sociologists' lingering reticence with respect to engagement with biology, albeit that there has been some softening of this position over the last decade or so. This piece asserts that overcoming remaining sociological reservations regarding the biological offers considerable potential, in terms of enhancing our theoretical models and understanding of aspects of the social world, potentially offering fresh insights with respect to some perennial issues and concepts. Here, an example of this potential is offered through a neurosociological reframing of the foundations of social structure and the rationalisation of conduct.

Keywords: Neurosociology; Bio-phobia; Social Constructionism; Extended Mind; The Social Map; Social Structure; Rationalisation.

Introduction

> Sociologists often react with hostility to explanations that evoke biology, and some critics of the discipline contend that this 'biophobia' undermines the credibility of sociology and makes it seem increasingly irrelevant in larger public debates (Freese et al, 2003: 233).

It may be fair to suggest that, for *most* of its history, sociology's relationship with biology has been a somewhat uneasy one. As Renwick has explored in some depth, however, this was not always the case (2012). Until the early years of the 20th century sociologists had drawn heavily on evolutionary and biological knowledge in their formulations, only to distance themselves from the latter with a view to establishing a clear and distinctive disciplinary terrain for sociology (Renwick, 2012). Since then, informed to varying extent, acknowledged or otherwise, by the intertwining legacies of Judeo-Christian religion, Descartian dualism and European idealism, sociologists tended to embrace notions of human exceptionalism and, by extension, the conviction that biology could be regarded as being largely irrelevant to the study of self and society (Fitzgerald and Callard, 2015). Implicit in this view, human beings were to be set aside from the rest of the animal kingdom as creatures of culture, somehow beyond nature, while a parallel and associated cleavage between mind and body implied that the social world might be studied with reference to the former while safely ignoring the latter (Udry, 1995). In qualification, however, while many sociologists (and other social scientists) continue to hold such views, this position has been shifting to some degree more recently (Canter, 2012; Landecker and Panofsky, 2013; Meloni 2014 a,b; Fitzgerald and Callard, 2015).

The Recall of 'The Wild'?

Amongst contemporary sociologists willing to re-examine the boundaries between nature and culture a range of positions has emerged, reflecting various gradations of ease/unease, regarding the relationship between these spheres. Common to many accounts, however, specifically in terms of their depiction of human attributes, those features that might qualify as being natural are regularly presented as being confined to some fairly low level capacities and propensities which are themselves largely overwritten by social learning.

> The basic desires of human nature are the desires for food, health and physical comfort, sexual pleasure, social pleasures, creative expression, autonomy... All of these elements are profoundly shaped by culture... (Leahy, 2011: 2).

It has also been suggested that a common strategy for calling into question natural/biological influence on self and society has been for social scientists advancing a 'strong constructionist' view to depict cultural variation in terms of a radical incongruity of condition and conduct, both geographically and historically, offering this as evidence of the unequivocal cultural foundations of the human condition and social life.

> Between our immediate primate ancestors and humans, we imagine that something happened that suddenly freed us from having evolved behaviors. We

> imagine that the nature of humans is to have no nature. We look at the variety of human cultures and see only diversity (Udry, 1995).

As Konner observed, such accounts have tended to highlight cross-cultural exceptionalism, while simultaneously downplaying or overlooking the significance of any potential cross-cultural universals, as a seeming strategy for defending the constructionist paradigm (1991). Thus, apparent consistencies in terms of emotions, action, social structure and organisation have been undermined with reference to 'special cases' that are assumed to falsify the whole and, thus, the radically culturological conception of the human is sustained (Konner, 1991).

Since the 1990s, however, developments associated with the so-called 'neuroscientific revolution' - where new knowledge relating to the structure and functioning of the human brain has been advanced, largely by developments in neuro-imaging technology – has arguably returned the nature/nurture question to centre stage. As is argued below, new knowledge emerging from neuroscience not only presents a challenge to many of the assumptions informing more entrenched anti-biological perspectives within the social sciences, but also, following from this, has implications for how we might understand the human mind, human condition and, thus, the social.

From 'Mind' to 'Social Brain'?

While, as above, sociology has long held the biological at arm's length, it may be uncontentious to observe that since the discipline's inception sociologists have, explicitly or implicitly, engaged with psychological understandings of the human mind. This even applies to Durkheim, whose focus on 'social facts' as the subject matter of sociology, and asserted rejection of psychological explanation, is tempered at various points by an observable degree of ambiguity in his writings with respect to the relationship between the disciplines (1982 [1895]).

Perhaps the most overtly psychological approach within the sociological discipline is the Symbolic Interactionist tradition pioneered by George Herbert Mead. Mead's work, while influenced by Darwin, also drew heavily on Weberian and Simmelian sociology, Freudian psychology as well as Pragmatist and Hegelian philosophy. His theoretical framework was also crucially shaped by its opposition to the Behaviourism of Watson and Skinner.

With respect to the issues at hand, while Mead drew on biology and biological metaphor, his conception of the development of the self tended to remove the social individual from the biological to a significant degree, proposing that the 'social self' was a product of the 'social organism', with minimal input from individual biological makeup. Thus, while Symbolic Interactionism departed significantly from Durkheim's privileging of *structural* forces in shaping the individual, considering the latter to be constituted of an over reification of the dynamic interaction order, the social nonetheless retained its discrete position over the biological in the constitution of self and society in Mead's work (Silva, 2007).

Aside from influencing the latter, it might be argued that Freudian and Neo-Freudian psychoanalysis has been even more prominent in informing conceptions of the human subject

across a broad range of other sociological theories. From Elias through Giddens and Postmodernism, and not least Cultural Studies' engagement with its Lacanian variant, psychoanalytic theory has and continues to exert a profound influence on many sociologists who wish to engage with the 'psychosocial' as, together with Symbolic Interactionism, it remains the 'respectable' psychological 'intruder'. This position, however, can be viewed as being somewhat questionable from a number of standpoints.

In the first instance, it can be argued that many of the key propositions of psychoanalysis have been rendered obsolete and/or erroneous through experience and evidence, such that it no longer holds much sway within academic psychology other than as a historical milestone [1](Kihlstrom, 2009). Moreover, it might clearly be suggested that distinguishing mind from brain, as is common in psychoanalysis, of itself appears a highly contentious proposition. Indeed, Freud himself did not hold so unambiguously to the separation of mind and brain that appeared to be advanced by many of his successors. Rather, he sought to establish a 'Project for a Scientific Psychology' that dissolved the mind/brain dichotomy, but was deterred by the paucity of neurological knowledge of his time. It was his followers who, in effect, abandoned this project and who consolidated the mind/brain split within psychoanalysis (Tasman, et al, 2008). By contrast, many of the insights afforded by contemporary neuro-imaging technologies have presented a clear challenge to this position; 'change the mind and you change the brain' is a standpoint advanced by the majority of contemporary neuroscientists (Paquette et al, 2003). Consistent with the perennial controversies surrounding conceptions of the psyche, however, it remains clear that neuroscience has thus far failed to put questions regarding the locus of the mind beyond contestation. Rather, over the last couple of decades another front has emerged in this debate, proposing in a sense a further supra-organic dimension to cognition and experience, associated with the so-called *extended mind hypothesis* (EMH).

Extended Mind?

Amongst the range of standpoints associated with the extended mind hypothesis, cognitive processes tend to be depicted in the form of embodied, embedded and, indeed, extended cognition. The first two are, arguably, broadly reconcilable with the cognitive neuroscience perspective if, in the first case, we merely posit that bodily states and sensory feedback contribute to cognition or, as in the second, we accept that our thought process are always situated or 'embedded' in the wider environment, if this is understood in terms of re-imagining a dualistic or dialectical ongoing interaction between brain and environment (a position supported herein) as being a somewhat more holistic process than is represented by a more strictly cognitivist position (Rupert, 2009).

It can be argued, however, that some variants of the extended mind perspective also posit a further and more contentious remove with respect to the relationship between brain, mind and the external world. Indeed, some of the more strident propositions seemingly argue that consciousness itself can, in a sense, be located beyond the brain (Noe, 2009). A more

[1] Psychoanalysis, despite its eclipsing within mainstream psychology, remains popular in some quarters of the psychiatric and counselling professions as well as the arts and social sciences.

nuanced version of this line of argument, however, advanced by Clark and Chalmers, asserts that the mind, as associated with 'cognition' rather than 'consciousness' (they do not claim the latter), extends 'beyond the skull' (1998).

It must be noted that Clark and Chalmers (or indeed Noe or any of the numerous other advocates of this position) do not seriously depict the mind as being akin to some Cartesian non-physical phenomenon. Rather, by various means, the argument is presented that the brain is in a sense only one amongst a range of components of mind. In Noe's case, there is the suggestion that conscious thought involves life history and environmental engagement such that these must be considered to be components of an inclusive process (2009). Clark and Chalmers, in turn, propose that the employment of external supports to cognition such as writings, computers, mobile phones, where they aid memory and supplant or perform cognitive *functions,* can be regarded as aspects of cognition and, thus, of mind (1998).

The above necessarily skims the surface of this debate, as there are innumerable nuances and 'thorny' arguments associated with these aspects of EMH, such that serious engagement of adequate depth and breadth is well beyond the scope of this piece, while many of the issues are, to some extent, tangential to the main line of argument presented here. My own view tends to roughly align with that of the critics of the more overtly 'externalist' EMH propositions, in that the latter may overextend the mind, particularly where there is an attempt to assign parity between external adjuncts to cognition and the workings of the brain (Adams and Aizawa, 2010). As Fodor argues, the connectedness between cognitive supports and cognition itself (associated with the brain) may be overstated and, thus, misconceived. The line of argument he advances here is along the lines that the use of tools such as microwaves or food processors may be viewed as part of the cooking process, but it does not follow that these implements can be regarded as extensions or components of the cook (2009).

One final variant of EMH that warrants particular mention advances the notion that cognition might be shared between individuals and social groups (Huebner, 2014). However, there may also be problems inherent in overstating this form of connectedness and, thus, in underplaying the significance of the subjective in social processes. Firstly, while others' thoughts may not be wholly closed to us, and evidently a significant portion will be communicated, the boundary between our inner and outer worlds and its relevance for social interaction and social processes has been widely recognised and subject of a great deal of sociological work (Silva, 2007; Goffman, 1959; 1973). Evidently, it might also be noted that what might be characterised as collective cognition, as evidenced through collective agency, may also be understood in terms of the decision making and intentions of particular individuals merely being followed and enacted by a collective (Huebner, 2014).

Overall, it may be suggested that the extended mind hypothesis could be regarded as a somewhat seductive proposition for sociologists, given the discipline's longstanding anti-biologism, privileging of the external, and concomitant shying away from subjective explanations in approaches to understanding social life. However, it may be also be argued that external artefacts and experiences, including those associated with social interaction, are surely only meaningful as they are apprehended, utilised and, in some cases, created by a

brain that has the capacity to understand, reflect and, where appropriate, initiate action. In short, at the very least, the brain is a pivotal and essential locus of thought and action, while revealing its structure and functioning is undoubtedly an important, if not crucial, pursuit in gaining a deeper understanding of the human condition and, thus, social processes.

Neurosociology, Social Neuroscience and Neural Selves

As noted above, neuroscience has made considerable advances in recent decades with respect to understanding the structure and functioning on the human brain/mind. It might even be suggested that this has occurred in a manner that appears somewhat analogous to the supplanting of the medical models of the medieval era, notions of bodily 'humors' and so on, with more scientifically founded knowledge of human anatomy and physiology.

Such has been the impact of these developments that new social sub-disciplines have emerged in their wake within Anthropology, Economics, Archaeology, Philosophy (the list being far from exhaustive), which have adopted a 'neuro' prefix to identify engagement with this emerging body of knowledge. As suggested above, sociology has been a little more cautious in this regard. One evident danger in sustaining this reticence, however, is that other disciplines may colonise the territory of providing neurologically informed understanding of the social realm, offering more compelling explanations and, thus, undermining the sociological discipline itself. In fact, illustrating an appreciation for the potential explanatory power of neuroscientifically informed theory, a growing cohort of neuroscientists and neuropsychologists, within the burgeoning sub-discipline of Social Neuroscience, are now applying their understanding of brain structure and function to explicitly sociological questions (Macrae and Bodenhausen, 2000; Emery, 2007; Decety and Cacioppo, 2011).

On a note of caution, however, it might also be noted that the proliferation of 'neuro' sub-disciplines has also attracted criticism, in terms of the trend being representative of an emerging 'neuromania'; arguing that exponents of the latter have far too keenly embraced the alleged possibilities that neuroscience has to offer the social sciences (Tallis, 2011). Indeed, on balance, it may be argued that it is important to ensure that, in their enthusiasm, social scientists do not lose sight of the strengths of their own disciplinary heritage, overstate the significance of contested neurological findings or, indeed, the contribution that social science can reciprocally offer the neurosciences, more of which below. Overall, however, while it may indeed be important to proceed with caution, retaining a healthy scepticism with respect to overzealous claims, this does not negate the potential for fruitful exploration of the possibilities presented by these developments.

Towards a Biosocial Discipline?

Despite the reservations identified above, as noted, the positive potential in re-examining the nature/culture boundary has been recognised by a growing number of sociologists (Inglis et al, 2005). A significant proportion of those now working in this area are social scientists engaged in exploring the neuroscientific revolution's wider societal implications, as well as its potential ramifications for sociology and other social sciences (Williams, 2010; 2011).

Others, however, are drawing explicitly upon neuroscientific evidence in their social scientific theorising and analysis (Franks, 2010).

It seems clear that even amongst relative enthusiasts that, once more, a fairly broad spectrum of opinion persists in terms of how the relationship between biology (including neurology) and culture is deemed to operate in the constitution of human development and selfhood. On the one hand there are those whose position holds more closely to the more determinist perspectives of sociobiology and evolutionary psychology, or who may have indeed become overly enthusiastic with respect to the explanatory power of contemporary neuroscience (the aforementioned 'neuromaniacs') and, thus, may have a tendency to privilege the biological over the cultural. Conversely, others tend to advance a view where brain development itself is contingent on the social (and physical) environment (Fitzgerald and Callard, 2015). Moreover, such arguments are by no means confined to the social sciences but are also reflected, arguably to a lesser degree, in positions advanced by neuroscientists themselves, with implications for our understanding of the malleability of both the organism and its conduct.

Some perspectives, for example Fodor's Modularity Thesis, have tended to present the brain as being a relatively fixed entity, constructed of a collection of innate modules of evolutionary origin with largely discrete properties and functions while, by contrast, others view the brain as being more holistically organised and largely constructed by experience (Fodor, 1983; Elman et al, 1996; Marcus, 2006). A way through this overall dilemma, however, is to view the brain from the perspective that appears to have most traction currently; where evolutionary derived modules are subject to ongoing adaptation, during development and throughout the lifetime of the individual (LeDoux, 1998; Marcus, 2006; Meloni, 2014 a,b; Landecker and Panofsky, 2013; Bone, 2005). Thus, there are a growing number of both natural and social scientists who now consider nature and culture as being mutually constitutive, as operating in a dialectical process of mutual 'co-construction' (Bone, 2005; Franks, 2010; Meloni, 2014 a,b). This position can be seen to have been further informed to a significant extent by increasing understanding of neural plasticity and, more recently, developments in epigenetics (Meloni, 2014 a,b; Landecker and Panofsky, 2013).

Plasticity and Epigenetics

With respect to neural plasticity, the notion that brain development is not fixed but is shaped by an ongoing process of connecting and pruning of neural/synaptic connections in response to experience has been recognised for several decades, indicating that a non-deterministic biosocial model was possible. Moreover, the recognition in the emerging sub-discipline of epigenetics that even gene expression (rather being a straightforwardly constitutive process) is also highly environmentally sensitive, has further supported the position of those who have begun to view brain/self construction as being very much an ongoing bi-directional biosocial process (Landecker and Panofsky, 2013).

Given the above, it might also be observed that the growing, if still cautious, acceptance of biological input with respect to the social has been influenced by the recognition that input

from the neurosciences, on closer inspection, may be broadly compatible with a large swathe of sociological theorising, as argued below, while the fact that the brain responds profoundly to experience suggests that there may likely be a reciprocal role for sociologists, and other social scientists, to inform neuroscientific understanding with respect to the form and nature of the social process that contribute to the ongoing development of human neurology. Nonetheless, beyond illustrating that the brain and the social are mutually constituted in various ways, what further may the neurosciences offer the social scientist?

It is argued here that it may be by exploring some of the limitations and propensities imposed by the major structuring of the brain - recognising that brain morphology and function is only free to vary within certain limits due to its overall composition - that a significant furthering of sociological and social scientific understanding of our traditional fields of study may be achieved. This view is consistent with Waddington's canalization thesis – where environmental and, thus, epigenetic influences on the genotype are buffered by a process whereby development follows particular channels – and thus a broadly similar phenotype will emerge despite the influence of a significant variety of environmental conditions (Waddington, 1942; 1957). Very broadly speaking, one might argue that the combined effects of epigenetics and plasticity may account for a range of individual differences, founded on different pre and post-natal environmental interactions, while canalization implies that the basic neurological structures and functioning of the human brain, barring very significant developmental problems, is common to the species as a whole.

In sum, the perspective presented here posits that these *robust* features of neural structure and functioning may have a profound role in shaping the social environment, just as the latter reciprocally influences individual brain development throughout the life course. Just such an argument is taken up below, in this instance, through a biosocial re-appraisal of sociological understandings of the 'emergence' of social structures.

Re-assessing Sociology's Foundations?

As implied by the above, by ruling out of bounds certain forms of biosocial knowledge, a significant proportion of mainstream sociology to this point can, arguably, be seen to have delivered elaborate description, or incomplete rather than satisfactory explanation, with respect to some key aspects of social processes. A good example of this might be illustrated in the debate around the perennial 'problem of order' and the roots of social structure.

This is an issue that has engaged the discipline since its inception. Thus, from Durkheim through Parsons to the contemporary field, sociologists have sought to understand how the everyday activities of vast numbers of seemingly autonomous individuals appear to coalesce around discernible and relatively enduring social patterns (van Krieken, 2003). In summarising these debates van Krieken, in addition to recognising its ongoing status, also notes that contemporary deliberations concerning the roots of social structure remains highly influenced by Parsons' Durkheimian inspired thesis, that social order is an outcome of the externally imposed injunctions of emergent norms and values of society, as they are internalised by successive cohorts of social subjects. As many sociologists are aware, the

latter has also been subject to exhaustive critique in terms of the implied cultural determinism in Parsons' formulation and the concomitant failure to adequately reconcile the socialised subject with the spontaneous, autonomous individual, which was his asserted aim. In this particularly lucid discussion van Krieken depicts the opposition between individual and society, agency and structure, as an unnecessary and erroneous 'blind alley' - a false distinction - that, as such, inevitably cannot be wholly reconciled (2003: 2). He goes on to suggest, however, that Norbert Elias's figurational model, reviving a line of thinking central to Georg Simmel's sociology, goes some way to resolving this issue by understanding the individual and society as being two interconnected elements of an ongoing dialectical process, simultaneously autonomous and conforming, with the internalised social representations required to effectively engage with others in meaningful interaction shaping a 'habitus' that offers the possibilities for both action and constraint (van Krieken, 2003). As is apparent, this kind of resolution, with some elaboration, clearly resonates with both Giddens' and Bourdieu's more recent 'syntheses' (Giddens, 1991; Bourdieu, 1984).

Throughout of all of these formulations there is a common thread, in terms of the fact that they expressly evoke the psychological as a means of understanding these aspects of the social fabric. This is made explicit in Elias's case where '(h)e argues against the separation of psychology, sociology and history, suggesting that a single human science would address the ways in which "the structures of the human psyche, the structures of human society and the structures of human history are indissolubly complementary and can only be studied in conjunction with each other" (Elias, 1991: 36 as cited in van Krieken, 2003: 5). Elias' proposed model of ongoing 'psychogenesis' and 'sociogenesis' where the self and social, including its wider structural formations, are constitutive of each other seems to make a good deal of sense in light of the forgoing argument, while perhaps owing no small debt to Simmel's depiction of the social individual as being constituted of an ongoing dialectical process of exchange between the internal and external (Simmel, 1903)[2]. Returning to the question at hand, however, as strongly implied in van Krieken's piece, there is something almost intangible that is absent from this Eliasian/Simmelian formulation where he alludes to an almost unconscious drive or motivation amongst individuals to produce a shared and coherent basis for social interaction; a tendency towards 'spontaneous' social order (2003). Giddens also picks up on this in his own neo-Freudian inspired proposition that 'ontological security', a sense of psychological and emotional 'security', can be equated with routine and a sense of predictability and control. Thus, he argues that human beings exhibit a preference for the latter (Giddens, 1991).

What seemingly remains missing from such undoubtedly important and insightful formulations, as is argued below, is both the profound influence of our biological constitution in shaping these processes and a more precise analysis of how they might operate.

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[2] It might be noted here that the internal and external are complementary but distinctive elements in this process and thus, there is little sense of the parity between or indeed continuity of these spheres implied by the extended mind hypothesis.

It is argued here that the failure to put the 'structure/order' debate conclusively to rest is due to the fact that, by adhering to sociology's methodological injunctions, we have been looking in the wrong place. Applying the principle of Occam's razor, rather than arising from mysterious external forces or vaguely explored aspects of the self, might human beings be simply innately oriented to produce structure and order and, crucially for the argument at hand, could engagement with a fuller understanding of our biosocial constitution further illuminate our understanding as to how this might arise? This is addressed below, further extending a line of argument previously explored elsewhere, with a view to both illuminating understanding in terms of this specific issue, while also illustrating the potential utility of adopting this kind of biosocial approach (Bone, 2005; 2010).

The Social Map and the Nature of Structure

It is argued here that three major brain regions may be seen to be centrally (albeit not exclusively) involved in our engagement with these particular aspects of the social; the prefrontal cortex (pfc), the amygdala, the hippocampus, as well as a range of further regions such as the nucleus accumbens, and cyngulate gyrus all of which are involved in *executive* (including social) functioning and memory formation (Fuster, 2008).

The pfc is a pivotal region, given its association with working memory and its key role in terms of conscious awareness, deliberate calculation and reflection (Fuster, 2008). The amygdala, a central structure of the limbic system, was once thought to be wholly associated with focusing our attention on danger, both novel and remembered; with fear, anger and the encoding of memories and the stimulation of adaptive sympathetic responses (LeDoux, 1998). However, it now appears that this structure (there are actually two) not only focuses our attention on threat but also opportunities, and is responsible for evaluating both positive and negative experiences, contributing to experiences of value, meaning and significance while stimulating the hippocampus to initiate the storage of long term memories of significant experiences whose recollection may be adaptive in the future. In essence the amygdala helps us to identify and remember threats and opportunities as well as a host of other meaningful and significant memories for subsequent recall (Hamman et al, 1999).

The hippocampus, in turn, plays a crucial role in spatial orientation and memory and, as above, in facilitating the formation of the explicit and episodic memories crucial to the construction of selfhood, the internalised lifeworld that mediates our interaction and experience. In short, it is a key structure enabling us to 'map' our environment and to remember what we experience within it. In addition, it has been suggested that the cingulate cortex, a closely aligned and connected limbic system structure may be implicated in the 'mapping' of our social relationships, in addition to regulating some of our autonomic functions (King-Casas et al, 2005). It is through these and ancillary structures that we both assimilate and utilise the knowledge we have acquired with respect to both the physical and social environment. While, as suggested, this is an extremely brief and partial description, certain features of the functioning of this network can be seen to contribute to our understanding of some key sociological questions, and not least the problem of order (Bone, 2005).

Two key factors can be seen to be at play here. Firstly, the pfc's very limited processing capacity means that the 'cognitive load' we can accommodate at any given point, the amount of information/experience we are called upon to deal with, is highly constrained (Paas et al, 2004). Secondly, as the amygdala operates to focus attention and evaluate opportunities and threats in our environment, triggering emotional responses, when we feel that we cannot readily accommodate or process what is going on around us we experience 'cognitive overload', and a concomitant stimulation of negative emotional arousal ('fight or flight') from the amygdala, given that we are no longer in a position to readily evaluate, assimilate and accommodate our experiences, and may be 'missing' opportunities or indeed threats. Put simply, the limited capacity of our conscious interface with the world operates like a bottleneck while, when its capacity is stretched, an emotional alarm is triggered signalling that we may no longer be equipped and prepared to deal effectively with what we may encounter (Bone, 2005; 2010).

In qualification, such a view might be challenged by proponents of the extended mind hypothesis, discussed above, on the grounds that the ability to store information externally and to share or automate various tasks may render more complex endeavours possible, by supporting memory and reducing the burden of calculation and so on. While there is no doubt that the latter can extend human capabilities in general this does not, however, overcome limitations in terms of the individual's capacity to concurrently deal with conscious processing of information, experiences and the demands of simultaneous and multiple social encounters. On a fairly evident point here, the ability to employ tools and technologies to facilitate more complex activities has, of itself, been integral to the generation of more complex organisational forms, social relations, workplaces and environments which, in various ways, have increased the burden on our limited conscious processing abilities (Kirsch, 2000). This phenomenon is robustly evidenced and has evident resonances with the social psychologist Kenneth Gergen's concept of 'Multiphrenia', Milgram's Urban Overload Theory and Simmel's notion of 'nervous exhaustion' elicited in complex modern environments (Gergen, 1991; Simmel, 1903). More recently, some research has proposed that those raised in urban environments have more 'sensitised' amygdalae than rural dwellers (Lederbogen , et al, 2011). Thus, it may be, given that our neural architecture evolved in a much simpler pre-modern social milieu, that we are ill-equipped to accommodate to the change, complexity, ambiguity, insecurities and population densities associated with modern urban living (Dunbar, 1992; Bone, 2010).

Confronting Complexity

One crucial way in which human beings attempt to cope with the limitations of our conscious processing capacity is to 'routinise' well-practiced and learned activities and experiences, in broadly similar manner to the way in which we acquire and employ our motor capacities. In essence, as we build an internal map of our world, 'engrained' in our neural 'circuitry', we equip ourselves to deal with these well-practised routines in familiar settings at a very low level of consciousness. This, I would suggest, is broadly what Elias and Bourdieu refer to as habitus and Giddens refers to when he talks of 'practical consciousness' (Elias, 1939; Bourdieu, 1984; Giddens, 1991). This 'routinising' capacity leaves the executive (pfc) free to

deal with those tasks that require specific attention i.e. unanticipated ambiguous, novel experiences as well as those previously identified as being highly significant. Thus, so long as our engagement with novelty, ambiguity and complexity is kept in check, in terms of volume and pace, we can go about our daily business in reasonable emotional 'comfort'.

This fairly simple set of relationships, however, has profound implications for understanding the question at hand, and also for a comprehending broad range of ancillary sociological questions (that, unfortunately, cannot be engaged with here). Principally, we can be seen to have a strong emotional interest/drive to keep novel experiences and cognitive demands in under control, such that we can deal with them comfortably. As a consequence, rather than social order being imposed externally, or by some 'spontaneous' emergent process, it may be imposed by all of us reciprocally in the emotionally driven ongoing quest to sustain our respective cognitive loads at manageable and, thus, tolerable levels (Bone, 2010). This goes some way to explaining why, in modern urban environments, we develop a protective blasé attitude and civil inattention, attempting to screen out unnecessary interaction, while mutually devising and imposing norms and values that constrain action and interaction; simplifying the social milieu to our collective and individual benefit (Goffman, 1973).

This motivation for simplification, predictability and routine can also be identified in our everyday routine interpersonal relations, where people have a general preference for others who share the major aspects of their worldview. It might be noted here that once we have acquired deeply engrained perspectives on our lifeworlds we become strongly invested in them given our reliance upon them to organise experience and guide our action, and thus they are resistant to revision, while negative emotional arousal arises when they are challenged. Thus, we generally prefer to engage with others who reinforce our perspectives and prejudices (Goffman, 1973; Aronson, 1995). We also trust those who appear similar to us as we assume that they are likely to act in similar ways to in given situations and, thus, we feel that we can anticipate their thinking and actions. Moreover, the converse also appears to be the case, that those who appear and act 'differently' may challenge both our internalised lifeworlds and our sense of 'normalcy' raising an emotional alarm (Goffman, 1973).

Evidently, competition within this process for individuals and groups to establish and sustain their own preferred version of normality lies at the heart of many of our political and associated power plays, where the ancillary quest to acquire resources might even be viewed, beyond the capacity to meet immediate needs and desires, as an aspiration to achieve control over our circumstances and, in some instances, over those we engage with.

Structure, Specialisation and Rationalisation

The overall process described above may also be extrapolated beyond the micro level. Thus, as societies and their activities and knowledge bases become more extensive and complex, we must increasingly specialise, routinise and organise collectively – technologically, organisationally and socially - to render our potentially bewildering modern collectives relatively predictable and manageable. As argued elsewhere, and while this is somewhat contentious, the roots of rationalisation and modern bureaucracy can be seen to be

organisational extensions and intensifications of this aspect of the limitations and propensities of our neural architecture (Bone, 2010). For example, in addition to the routinisation characteristic of bureaucratic organisations, their hierarchical structure, as with specialisation, can be seen to reflect the inherent cognitive limitations and our response to them described above. Thus, the handling of complex, large scale tasks can often only be achieved where a horizontal division of labour is complemented by vertical specialisation, where cognitive demands are reduced through being confronted at increasing levels of abstraction at each level in the organisational hierarchy (Bone, 2010).

Turning once more to the rationalisation of interpersonal conduct that complements these macro manifestations of the ordering imperative, it may be argued that these can also be seen to be clearly evidenced both historically and cross culturally, thus pointing towards some form of innate foundation. The view that there may something innate underlying rationalisation processes is consistent with the observation that regulation of conduct, structural organisation, and indeed various forms of bureaucratic order, appear across a wide variety of societies from the ancient world to the present, to a degree often consistent with the dynamic density, scale and complexity of those societies (Eisenstadt, 1993).

As further example, and while it may be controversial to suggest the following, might it be less than coincidental that Elias' civilising process, which he attributes to a cultural shift emanating from French Court Society, arises in tandem with the re-urbanisation of European cities, of which Paris was growing to be one of the most populous of the times?

> … human reactions to population density vary widely, ranging from aggression to withdrawal (Regoeczi 2003)…A recent study of 33 nation also found that historically dense nations have a much tighter culture than do sparsely populated nations (Gelfand et al. 2011) (Oishi, 2014: 589).

In sum, what is argued here is that there appears to be a relationship between the dynamic density of societies and the structuring of conduct and organisation at both the micro and macro level such that the latter may be viewed as being, in a sense, an epiphenomenon of the major aspects of our neurological functioning.

Homo Duplex and the Dialectic of the Self (The Janus Self)

Given the above, however, it must also be noted that this is evidently not the whole story as social life does not smoothly tend towards harmonious organisation, coherence, conformity, homogeneity and stability. Thus, the implications of this overall process are not uni-directional. Firstly, the very cognitive limitations described here entail that, as societies expand, differences between individuals and groups arise merely through processes of specialisation and differential experience, that must proceed from our inability to encounter and assimilate more than a portion of *the whole*, as both Durkheim and Simmel observed (Durkheim, (1960 [1893]; Simmel, 1903).

Moreover, and somewhat paradoxically, it also appears that while we indeed have a general preference for the routine and predictability that enables us to cope cognitively and

emotionally with everyday life, there may be limits to this latter tendency. Thus, in order to sustain a sense that life is meaningful and coherent - and that we have some sense of autonomous and distinctive existence in the social world that is crucial to understanding how we relate to it rather than being subsumed by it - we appear to need sufficient cognitive load and concomitant emotional arousal to render life and the objects and others we encounter meaningful. Emotional arousal is also necessary to facilitate memory formation. Thus, without a degree of emotional arousal elicited by our surroundings and encounters we would experience a homogenous and undifferentiated world, as bewildering to us as the experience of unbridled complexity and chaos. In short, a dearth of cognitive load, and concomitant very low emotional arousal, may be seen to be as problematic as that which is overwhelming.

This would go some way to explaining why, despite our aforementioned drive for routine and simplicity we are averse to stultifying organisation and predictability when this threatens to overly constrain selfhood and experience. This might account for the both Durkheim's observation regarding the negative psychological consequences of the anomie produced by normlessness and structural disintegration and also, conversely, the fear of the iron cage of suffocating organisation that Weber portends (Durkheim, 1960 [1893]; Weber, 1930). This perspective is also broadly consistent with Durkheim's concept of Homo Duplex and Simmel's dialectical conception of the self, albeit that each allocates a different degree of autonomy and constraint within this balance of opposing forces (Durkheim, (1960 [1893]; Simmel, 1903). Overall, at one end of this polarity there is anxiety, stress and disorientation and at the other a spectrum of disaffection from mere boredom to depression, meaninglessness and depersonalisation, dependent on the level of emotional arousal triggered by our experiences and, to some extent, the individual sensitivity of our nervous systems (Bone, 2010).

In effect, negotiating a reasonably comfortable path between both of these polarities, that are shaped by our neurological structure and functioning, suggests that to achieve a level of emotional comfort we are as individuals constantly walking a precarious cognitive tightrope - between routine and diversity, conformity and autonomy, predictability and novelty, clarity and ambiguity, simplicity and complexity, security and insecurity - while the collective outcome might be characterised as a homeostatic social order; stabilised by convention, inertia and discernible structures, but also exhibiting elements of diversity and ongoing change. With respect to homeostasis, the application of the concept to the social system by Parsons may have been on the right track, with the caveat that he may have misallocated its real origins, as residing within ourselves as a consequence of our neurally mediated capacities and limitations (Parsons, 1951).

Conclusion

As argued above, the question as to whether sociology should set aside lingering reservations and seriously engage with neuroscientific knowledge appears to be, to adopt a rather pithy colloquialism, a 'no brainer', while this appears to be the slow but ongoing direction of travel at present. This gradual shift, as suggested, may be seen to have been aided by the increasing awareness that the major propositions of current biosocial knowledge imply a role for biology

in social life that in no sense eclipses that of culture, offering the prospect of a biosocial terrain that departs significantly from the more deterministic formulations that have appeared as anathema to many sociologists and other social scientists. The possible benefits of adopting such a standpoint rests of the perspective that, while sociology has and continues to collect rigorous empirical data and present compelling and insightful analysis, there is arguably an element of weakness or significant gap with respect to our theoretical models and, thus, in our capacity to explain various aspects of social processes. As with earlier psychological concepts and constructs, including those sociologists have 'adopted', too much theoretical space may be occupied by speculation and supposition, largely due to the fact that more empirically grounded knowledge of the human thought processes and behavioural tendencies that might provide more informed accounts has been scarce and/or inconsistent. This piece argues that this is increasingly being revised, potentially offering significant advances in the levels of our understanding and the validity of our theoretical models, while the reformulation of the foundations of social structure is offered as an example of how fresh insight can be gained from such an approach. Indeed, such is this promise that it might be argued that we are offered the possibility of moving beyond what August Comte may have characterised as the metaphysical stage in our disciplinary development, to forge an even more empirically grounded sociology. Moreover, following this path may re-establish sociology as a discipline that might even go some way to fulfilling the highly ambitious vision that Comte once imagined, as being the social science that draws together knowledge from a broad range of sources to offer a comprehensive understanding of our engagement with the social world.

On a final caveat, however, and as noted above, sociologists should approach this challenge while retaining their customary critical and sceptical stance, towards the 'neuro' in the same manner in which they would presumably approach any body of knowledge, while avoiding the temptation to accede to uncritical 'neuromania' and, thus, remaining careful, cautious and reflective when evaluating and selecting from the range of, at times, conflicting and, occasionally, confusing evidence and argument emanating from the contemporary neurosciences. Indeed, on this latter point, it may be that the neuroscientist engaged in biosocial work may have as much to learn from his/her social scientific counterpart as vice versa, if the goal of producing a complementary body of knowledge that further illuminates understanding of the human condition and the wider social world is to be realised.

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