

Editorial introduction

The biosocial: sociological themes and issues

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Biology: Scott and Marshall's authoritative and bestselling *Dictionary of Sociology* (2009) has no entry for it. There are entries for Wilfred Bion, the Kleinian psychoanalyst, or for sociometry, the almost-forgotten method of measuring social relationships. In place of biology, we find an entry for 'biological reductionism, or biologism', a pejorative term indicating the ideology of the deterministic application of biological findings to society. To make things more problematic, biologism has one reminder, Robert Ardrey, successful science-writer of stories of killer-ape human ancestors, very popular between the 1960s and the 1970s. Giants of the real history of biology, in contrast, such as August Weismann, or Theodosius Dobzhansky, are not even considered. And it is actually very difficult to imagine that Ardrey's speculation was somehow more relevant to the sociological imagination than Weismann's displacement of Lamarckism, or Dobzhansky's populational rethinking of race with its massive impact on post-1945 social sciences.

We begin on this admittedly somewhat polemical note not to start a further fire on the already troubled sociology/biology border. So many wars have already been fought, so much hostility has already been displayed that we really don't feel the need. Rather, in introducing this collection dedicated to *Sociology-Biology Relations in the Twenty-First Century* we wanted to bring to focus at the outset something that seems to us one of the very sources of so many problems, namely: *What do sociologists think of when they say the word 'biology' both as a way of conceiving vital processes (life as such in its manifold dynamics) and as a form of expert knowledge (biology as an academic discipline)? Furthermore, who do they cite as examples if not exemplars of this biology in question?*

As sociologists we have been rightly concerned at the caricatured view of the social that some biologists and evolutionary thinkers have put forward over more than a century. There is a long tradition of misrepresentations in conceptualizing the social and social sciences from Galton to Pinker. But have 'we' really done any better ourselves? Or have we shown similar tendencies towards caricature, lack of interest, and diffidence?

To understand both diffidence and lack of attention amongst sociologists, we believe, historical and sociological explanations, rather than moralistic or

psychological ones, can be given. As for sociologists' diffidence, history may offer some good justification. To name just one problem when the *Eugenics Quarterly*, organ of the American Eugenics Society, changed its name in 1969, it became renamed *Social Biology* (today *Biodemography and Social Biology*). Three years later, in 1972, the American Eugenics Society was renamed the Society for the Study of Social Biology. In parallel, and even more significantly given the choice of our title, *The Eugenics Review*, organ of the Galton foundation, ceased its publication in 1968 only to be resuscitated in 1969 as the *Journal of Biosocial Science*. So, labels like 'social biology' and 'biosocial', which we use in our title, are not free of historical connotations.

But it is not merely historical diffidence to explain the biological neglect on the side of social scientists. At a deeper level we believe that it has been exactly the initially healthy process of autonomization of the sciences of the social from biological frameworks (see in this volume, Keller, Meloni, and Renwick), that has turned this independence and self-sufficiency into a *positive injunction to ignore* biological processes (as the sum of life phenomena) and the complex and rich history of their conceptualizations (biology as knowledge production).

This move, we argue, has worked well and productively for almost all the twentieth century. However, one of the key contentions of this biosocial collection is that this 'ostrich-like' attitude is increasingly less tenable for two main reasons. The first has to do with the past, or possibly the archaeology of the social/biological split. The second instead looks at the (still open) present/future characterized by the emergence of new forms of biological and sociological knowledge.

First, it has become increasingly evident that the separation between the social and the biological was not something written in stone, a logical necessity, but rather the contingent effect of a specific history. Conventionally, histories of sociology point the finger at the naïve progressionism and organicism of late nineteenth-century biosociologies (Spencer, Espinas, Worms, von Lilienfeld, Schaeffle, Novicow, Ward) as a major cause for a separation between sociology and biological explanations. Roughly after the 1897 International Congress of Sociology (Barberis, 2003) more sophisticated non-biological explanations of social facts took place. Durkheim in France, Weber in Germany, or sometime later Hobhouse in Britain brought to completion a process of autonomization of the sciences of the social (as *sui generis* sciences) from biological analogies, models and explanations. This work of purification is often celebrated as the constitutional act of emergence of the social sciences from their self-incurred biologicistic minority.

However, two problems are neglected by this sort of whiggish history of sociology as self-emancipation from the biological. First, sociologists could not do it all by themselves. Often unnoticed, exactly at the same time, the last decades of 1800, a profound change in the understanding of biological heredity intervened that gave a fatal blow to the Lamarckism of many biosocial and organicist sociologies.

Against nineteenth-century chaotic admixtures of the social and the biological, the self-closing of biological heredity into a-temporal substance immune

from social influences (later christened the gene) provided the perfect tool to establish an important division of labour between what was designed to study biological *heredity* (ie genetics) and what focused on the investigation of the sociocultural *heritage*. More than any sociologist, an anthropologist, Alfred Kroeber, analysed by several authors in this monograph, is the most visible example of this awareness that, courtesy of a new biology, a new social science could finally emerge.

Secondly, what is left unseen by a one-directional history of sociology as progressive self-emancipation from the various biosociologies of the time is that, in cutting the knot of biosocial admixtures, nearly all the fathers of the sociocultural *depended on and took advantage of certain views* of the biological, even when opposing and breaking with it. This was true either for the reliance on the specific content of biological heredity, as in the case of Kroeber (Kronfeldner, 2009) or the importability of biological models, methods, or perspectives for the early Durkheim (Hirst, 1973; Gissis, 2002; Barberis, 2003; Marcel and Guillo, 2006) or possibly even later in Durkheimian posterity (Marcel and Guillo, 2006). Borrowing from Latour (1993), we argue that also for sociology, the modernist work of purification was mostly an illusory cover for a proliferation of conceptual hybrids and the intense – but unnoticed, or neglected – transfer of knowledge.

To this genealogical argument we add a second, taken from the present conceptual and scientific scenario. The pace of change in the understanding of the relationship between social and biological facts has accelerated rapidly over the last two decades, radically undermining some of the assumptions that constructed the modernist separation between the two domains. It would be too easy to show how the understanding of human ‘external nature’ has been socialized up to the point that the term ‘Anthropocene’ has been coined to describe the unprecedented impact of human actions as a truly ‘geological force’ on the global environment (Steffen *et al.*, 2011; see also Palsson, this volume). As it has been claimed, the emergence of the Anthropocene ‘represents the public death of the modern understanding of Nature removed from society’ (Lorimer, 2012: 593).

We want instead to focus on the profound changes to the understanding of the ‘nature’ internal to biological organisms, ‘biological nature writ small’ (Paxson and Helmreich, 2014: 166). For brevity we can only hint here at one of a series of complex and important developments and conceptual shifts that have recently resulted in a ‘social turn’ in biology (Meloni, 2014). Taken together, these developments mark a radical move away from key twentieth-century neo-Darwinist assumptions and include: (1) an unprecedented temporalization, spatialization, permeability to material surroundings, and plasticity of genomic functioning, with profound implications for the notion of heredity; (2) a shift in evolutionary thinking from individualism and utilitarianism to the current view of evolution as favouring prosocial behaviours; (3) The increasing understanding that the brain is a multiply connected device profoundly shaped by social influences. These changes are probably more visible for sociologists, but they are not the only ones in an increasingly unstable and exciting evolutionary debate. We can further

mention here, though only in passing; (4) an increasing emphasis on symbiotic processes (i.e. animals as ‘symbiotic complexes of many species living together’ see Gilbert *et al.*, 2012: 326) that undermines ideas of autonomy and independence of the single organism; (5) a new attention to microbial life and its conceptual implications in terms of networks of ecological interaction; (6) a destabilization of the notion of a universal tree of life based on the growing emphasis on phenomena like lateral gene transfer and chimerism (see good overviews in Dupré, 2012; O’Malley, 2014).

All these changes converge in showing that there is literally nothing in an up-to-date view of biology as the sum of life processes that can justify its equation with older metaphysics of nature, as a stable, discrete, insulated and pre-given entity.

Amongst these changes, the example on which we focus is particularly telling because, by eroding a certain view of heredity as cut off from environmental influences, it stands in stark contrast to a conceptual framework that stressed reciprocal autonomization of the social and biological sciences. We refer here to the fact that in genetics, the current complexities of postgenomic knowledge have undermined conventional views of the gene as a discrete, self-standing entity, and significantly expanded ‘the range of molecular actors’ that contribute to the functioning of the genome (Griffiths and Stotz, 2013: 2). This new conception of the genome is increasingly represented today as a ‘vast reactive system’ (Keller, 2012), an ‘exquisitely sensitive reaction (or response) mechanism ... for regulating the production of specific proteins in response to the constantly changing signals it receives from its environment’ (Keller, 2014: 2425). In this context epigenetics, ‘the study of changes in gene function that ... do not entail a change in the sequence of DNA’ (Armstrong, 2014: 3), has been increasingly highlighted as a key mechanism to reconfigure this broader understanding of the ‘reactive genome’ (Gilbert, 2003; Keller, 2012) as always unfolding in specific social and historical *milieu*.

However, not only is the human epigenome (the set of epigenetic changes in an organism) seen today as modulated by social experiences, but the same genome, which was supposed to be immune from this level of contingency, is increasingly understood as falling ‘*within the parameters of the human life span*’ (Lappé and Landecker, 2015: 153, our italics). This is a major shift from the fixed view ‘that came into being through the massive sequencing efforts of the 1990s and 2000 in which genomes were understood as “the same in every cell of the body for all of that body’s life”’ (2015: 153).

So, if some of the convenient notions that polarized the separation between the social and the biological as two distinctive fields are becoming *increasingly untenable* in the light of the new biology, what shall we make of our reassuring disciplinary division? Is it still possible to keep a purified vision of the ‘social’ when one of its supposed ontological ‘oppositions’ – the biological – is infiltrating its realm at every level and being infiltrated by it? The sense that we are at a critical point in the remaking of the biology/social sciences

border is exactly what prompted this call for various contributors to this collection.

The biosocial takes shape

The biosocial outside sociology

Attempts to overcome the conventional twentieth-century separation of the social from the biological are certainly not new or unprecedented. Along with the hugely influential work of Donna Haraway on nature-cultures (1991, 1997), and Latourian theorizations of hybrids and networks of nature and culture (1988, 1993)¹ entangled notions of the biosocial and the biocultural have emerged since the 1990s especially in medical anthropology, where several works have insisted on the culturally local and geographically diverse meaning of biological phenomena. Since the first seminal works by Margaret Lock on menopause in North America and Japan (1993), the notion of '*local biologics*' – defined as 'the way in which biological and social processes are inseparably entangled over time, resulting in human biological difference' (Lock and Nguyen, 2010: 90) – has emerged as a particularly important construct for the entangled nexus of anthropological research on human biology in the context of culture. Lock has recently written on the body in the era of the epigenome as a possible site of exploration for anthropologists 'to respond to a current move in epigenetics in which nature and nurture are no longer understood as dichotomous elements' (Lock, 2015). Concepts like 'embedded bodies' (see also Niewöhner, 2011) and local biologics, Lock claims, are used in this context 'to highlight inextricable multiplicities among material bodies and environments past and present: historical/socio/political variables, and subjectivities' (2015: 153).

In a different but parallel vein, works by Tim Ingold and Gisli Palsson, for instance, have pointed to the necessity of a dissolution of the 'conventional divisions between body, mind and culture' (Ingold, 1999). A recent collection by Ingold and Palsson (2013), nicely summarizes this novel *biosocial* approach that challenges the reductionisms of sociobiology and cultural constructionism alike (dissolving the pole of nurture into nature and vice versa, respectively), and puts forward an integration of 'the social and the biological ... ontogeny and phylogeny, organism and context, being and becoming' (Ingold and Palsson, 2013: 243).

Similarly, in his presidential address at the 106th Annual Meeting of the *American Anthropological Association*, Alan Goodman (2013) suggests 'Bringing Culture into Human Biology and Biology Back into Anthropology'. The biology that anthropologists today are looking into is a biology 'always interwoven with meaning' (Goodman, 2013: 368), influenced by social perceptions (Gravlee *et al.*, 2005), and in which socio-cultural categories (for instance: race and racial inequalities) are believed to have powerful biological effects. A good example is the recent work by Clarence Gravlee on the material pathways through which racism and social inequalities (as sociocultural categories) are embedded and

materialized in ‘the biology of racialized groups and individuals’; while at the same time embodied inequalities (the biological level) perpetuate and reinforce ‘a racialized understanding of human biology’ (Gravlee, 2009: 54). The biosocial and biocultural is also taking place in political theory, for instance in Samantha Frost’s *Biocultural Creatures* (2016) that aims to challenge ‘the idea of a pure nature or biology’ as insulated from social processes and the related view of human exceptionalism it endorses. In different streams, the engagement between political theory and neuroscience has been explored by several social and political theorists to highlight ‘the visceral register of subjectivity’ (C. Williams, 2007: 351), or, as in Connolly’s (2002) version of neuropolitics the ‘layered’ and somatic dimension of thinking, culture and politics.

Finally, in social epidemiology, a growing stream of research has focused on the notion of embodiment to emphasize the literal incorporation of the material and social world in which we live, from conception to death (Krieger, 2005: 352; Krieger, 2001, 2011). Embodiment, it is claimed, is an important theoretical construct that allows scholars to ‘embrace biologics while avoiding the trap of equating “biologic” with “innate,” and simultaneously embracing social processes without assuming the soma is governed solely by the psyche’ (Krieger and Davey Smith, 2004: 94–95).

The biosocial turn within sociology

Against social constructionist tendencies to reduce the body to a mere effect of language or power-structures, the turn to the body in sociology and social theory has been probably amongst the first to attempt a reincorporation of biological writings into sociology and social theory (Turner, 1984; Freund, 1988; Shilling, 1997, 1999, 2001, 2003, 2005; Williams and Bendelow, 1998; Williams, 1999, 2004; Williams *et al.*, 2003; Cromby, 2004, 2005, 2007; Newton, 2003, 2007). This stream of work on embodied sociology has not however been the only path.

Following Benton’s calls for ‘a re-alignment of the human social sciences with the life-sciences’ (Benton, 1991: 25), more recent calls have emerged in English-speaking sociology: to abandon biophobia (Freese *et al.*, 2003; Bone, 2009), to renounce the ‘elevation of the social over the biological’ (Massey, 2002: 1; see also Massey, 2004), and allow the possibility that the relation between biology and sociology be at the core of the new agenda of social science (Holmwood and Scott, 2007). If not in terms of calls, other authors have suggested a diagnostics of the present that puts at the centre a renegotiation of the boundary between biology and sociology and the making of a new sociological imagination (Fuller, 2007); a rediscovery of the biological roots of British sociology as ‘a history of future past’ (Renwick, 2012); claims that the human and social sciences are entering ‘a biological age’ and that the equation between the ‘progressiveness’ of theory and distance from biology seems increasingly questionable (Rose, 2013); arguments that biology is entering a social turn (Meloni, 2014); and finally that sociology may at last aim at a fully non-dualist perspective for which biology is ‘the possibility of culture’ (Newton, 2007: 80).

More ‘ebullient’ or neuro-enthusiast streams (to borrow a term from Fitzgerald and Callard, 2015) have tried to reconcile in a more direct way sociological research and neuroscience in what has been named ‘neurosociology’ (Franks and Smith, 1999; TenHouten, 1997; Franks, 2010; Franks and Turner, 2013). We shall come back in the final section to our concerns toward a sub-field with professed sociological credentials in which, however, there is precious little or nothing here on the social shaping or social production of the very neuroscience which neurosociology draws upon.

The integration of genetic measures into sociological research designs has also been a topic extensively explored by American sociology. A special issue of the *American Journal of Sociology*, for example, has gathered some of the most up-to-date attempts to rethink the nature of social structure and process, by ‘thinking about genetics’. Here genetic data emerge as a new archive in which sociologists may dig in without fear or prejudices but also without mythical expectations to find *the* solution to sociological dilemmas (Bearman, 2008; Bearman *et al.*, 2008; see also Freese *et al.*, 2003; Guo, 2006; Guo *et al.*, 2008; Freese and Shostak, 2009; Pescosolido, 2006; Pescosolido *et al.*, 2008).

Finally, recent works in the sociology of epigenetics have emphasized how the body bears the inscriptions of its socially and materially situated milieu, and the milieu is constituted by the socially modulated present and past biographies of the body: nutritional, metabolic, behavioural, toxicological, psychosocial, cultural, etc. (Guthman and Mansfield, 2013; Landecker and Panofsky, 2013; Meloni, 2014, 2015a, 2015b). For these new biosocial reflections, not only is genetic expression socially modulated (that is, influenced by power structures in society), but it is also the source of novel environments that will shape in their turn the ‘socially modulated biologies of further generations of organisms. The causal arrows go both ways, and the ontology of the gene as content and the environment as context ceases to make sense’ (Landecker and Panofsky, 2013: 21).

Overview of the papers

The fourteen papers in this monograph are divided into three sections, identifying some of the salient moments in the present process of remaking the boundaries between the biological and the social. The first two sections are historically and theoretically oriented, and include cross-disciplinary reflections from anthropology, and its history, and philosophy of biology. Section 3 instead looks at epigenetics and neuroscience, respectively, as two key areas of the new biosocial engagement.

Section 1: Rise of the new biology: implications for the social sciences

The first section includes four theoretical contributions aimed at exploring the novelties, epistemic solidity and conceptual problems evoked by the rise of the new ‘social biology’. In the opening piece (‘Thinking about biology and culture: can the natural and social sciences be integrated?’) Evelyn Fox Keller (MIT)

addresses the hopes, but also the persisting difficulties and anxieties regarding a possible integration of biology and culture. She asks how, in the light of conceptual and empirical novelties in genomic analyses that have highlighted the importance of gene regulation – that is, responding to environmental signals, from the immediate environment of the DNA, but ultimately from the distal physical and social environment – we are witnessing (at last) a rapprochement between the life-sciences and social sciences. In doing this she asks to what extent do the new promises of synthesis merely reflect an expansion of older reductionist aims, threatening once again to marginalize rather than incorporate the insights of cultural analysis.

In the second paper ('Cultural epigenetics'), Eva Jablonka (Tel Aviv) addresses the implications of recent developments in epigenetics for the study of social systems. Taking a Waddingtonian system approach she investigates how cultural practices 'lead to molecular epigenetic changes that in turn can contribute to the reconstruction of the system's dynamics'. In this way Jablonka aims to 'forge new experimental and conceptual bridges between biology, the social sciences and the humanities'. She in particular suggests that new techniques that allow the deciphering of methylation patterns in ancient DNA could be used to study the epigenetics of human cultures in long-gone historical periods, thus enriching and extending our knowledge of human history. Conceptually, she concludes, that an epigenetic perspective blurs traditional distinctions such as those between nature and nurture, plasticity and evolvability.

In the third paper ('From boundary-work to boundary object: how biology left and re-entered the social sciences') Maurizio Meloni (Sheffield) comes back in an archaeological and genealogical spirit to a founding event in the construction of the twentieth-century episteme. This was the moment at which the life sciences and the social sciences parted ways and intense boundary-work on the biology/society border was carried out, with significant benefits for both sides and important implications for the wider society at large. Galton and Weismann for biology, and Alfred Kroeber for anthropology delimit this founding moment and Meloni, using historical scholarship, argues for an implicit convergence of their views and shared aim of separating the social from the biological. After this excavation, Meloni looks at recent developments in the life sciences, and in particular at the burgeoning discipline of epigenetics with its promise to destabilize the social/biological border. In particular, he claims that, because of the rise of a new social and epigenetic view of biology, a different account of 'the biological' to that established during the Galton–Kroeber period is emerging today. Rather than being used to support a form of boundary-work between social and non-social disciplines, biology has become a boundary object that crosses previously erected barriers, allowing different research-communities to draw from it.

Hannah Landecker in her 'The social as signal in the body of chromatin' argues for the increasing centrality of the notion of the signal as mediator between the social and the biological body. Social things, she claims, become biological things because they are transduced into the body as material patterns of chromatin conformation and persist through the establishment of gene

expression potentials, physiological changes or epigenetic memories. In the paper she recounts the history of how biologists came to think in terms of signal transduction in the late 1960s, in investigating the biology of metabolic hormones. The cybernetic legacy of a body of transductions and signal cascades is important for understanding the ‘environmental turn’ represented by epigenetics. In conclusion, she highlights the importance of excavating and analysing the theory of the signal for understanding contemporary biosocial science.

Section 2: Thinking biosocially: promises, problems, prospects

This section includes three theoretical and historically oriented contributions on the sociology/biology debate. In ‘Unstable bodies: human variation in biosocial perspective’ Gisli Palsson (Iceland, and King’s College London) applies novel theoretical developments associated with notions of ‘biosociality’, ‘nature-cultures’ etc., to the issue of human variation and the material body. The body, he claims, has remained a black box, a mere site for social construction, while human variation has been conventionally left for those concerned with the ‘biological’ domain. Expanding on his former paradigm of ‘biosocial becoming’ (Ingold and Palsson, 2014), Palsson aims to rethink the body and human variation along these novel lines, exploring the significant biopolitical implications of this reconceptualization.

Tim Newton’s ‘The turn to biology’ adopts a sceptical approach that, although recognizing the potential for dialogue between the two disciplines, emphasizes the need for caution. He first points to some of the problems that may be encountered in establishing new disciplinary relations. This is done by examining the difficulties that may occur when drawing on non-human animal studies, given that they remain frequently deployed in the life sciences. In the latter part of the paper he goes on to examine some epistemological tensions that are likely to affect the transition between life and social science. Newton in particular argues that we must critically scrutinize life-science research and avoid *uncritically* ‘cherry picking’ works that *are conveniently consonant with social science assumptions*. In addition, he questions the feasibility of a unitary epistemology across the life and social sciences, and argues in favour of an approach that combines ‘parallelism’ with reflexivity.

Steve Fuller (Warwick) in ‘Organizing the organism: a re-casting of the biosocial interface for our times’, presents a future-oriented look at sociology and anthropology’s historical appropriation of the concept of organism. Beginning in the relatively familiar terrain of the role that medical conceptions of the organism in the mid-nineteenth century played in the formation of Durkheim and Boas, Fuller moves to discuss the specific ‘relativization’ of Darwin’s theory of evolution that fostered turn of the century conceptions of the social organism, including that emergent entity, the ‘superorganism’, which figures prominently – albeit differently – in the attempts to understand the uniquely ‘human’ character of culture and technology. Finally, the paper looks at one very explicitly ‘constructivist’ approach to the social organism promoted by the distinguished chemist Wilhelm Ostwald, who was in turn anathematized by Max Weber in one

of the original instances of sociology's disciplinary boundary maintenance. The paper ends with directions for further exploration, which involve reviving Norbert Wiener's cybernetic vision.

In the concluding paper of the section, historian of sociology Chris Renwick (York) in his 'New bottles for new wine: Julian Huxley, biology and sociology in Britain' turns to the work of Julian Huxley to draw attention to the importance of a dialogue between biology and sociology that recognizes the role for sociologists in shaping a distinct biosocial agenda that is separate from the priorities of biology itself. Focusing on Huxley's doctrine of 'scientific humanism', the paper uses historical tools to address debates about the interference between biosocial science and the progressive agenda that sociologists have traditionally seen themselves as contributing to. Renwick concludes that this issue is crucial in an age when the external environment encourages more collaboration between biologists and sociologists than ever before.

Section 3: Biosocial challenges and opportunities: epigenetics and neuroscience

Three papers in this section explore the relevance for sociology of the emerging field of molecular epigenetics, building on empirical research. Emma Chung (Leicester), Dimitris Papadopoulos (Leicester), John Cromby (Leicester) and Cristina Tufarelli (Nottingham), in their 'Social epigenetics: a science of social science?' highlight common epigenetic methods used to map gene-environment interactions and outline practical considerations in the design of 'social epigenetics' research. The paper discusses the strengths and limitations of dominant research designs addressing the identification of biomolecular pathways, and conceptualization of the environment as a biochemical event. They focus in particular on the problematic nature of constructs such as heritability of epigenetic alterations and intergenerational accountability, and the concept of time implied by attempts to capture complex, non-linear gene-environment interactions. In doing this, the authors reflect on the social epigenome as a conceptual space and try to identify barriers to translation, as well as practical and ethical issues raised by epigenetics research. In conclusion, they argue that in order for social epigenetics and social science to contribute to the emergence of this putative 'science of social science' and to capture meaningful human experience they will both need to change significantly.

Martyn Pickersgill (Edinburgh) in his 'Epistemic modesty, ostentatiousness and the uncertainties of epigenetics: on the knowledge machinery of (social) science' draws on interviews with leading UK bioscience researchers. To begin with, he highlights the (productive) uncertainties of those working in and around epigenetics, describing them in terms of a manifestation of 'epistemic modesty'. Employing the idiom of 'alien science', Pickersgill then details scientists' ambivalences regarding the controversial notion of 'transgenerational inheritance'; their dissatisfaction with the (public) communication practices of other researchers and the challenges they face when seeking to moderate public discussion in ways that expand excitement in bioscience whilst deflating unrealistic expectations.

The paper concludes with reflections on the knowledge machinery of the (social) sciences, and sociological engagements with epigenetics.

Luca Chiapperino and Giuseppe Testa (IEO and University of Milan) in their 'The epigenomic self in personalized medicine: between responsibility and empowerment' focus on two areas of innovation currently articulating the agenda of personalized medicine (PM): the discourse of empowerment in health-care reforms and the rise of molecular epigenomics. They start by aligning these two developments as discursive and technical resources, focusing on their nascent interplay in shaping alternative sociotechnical imaginaries of personalized medicine. In doing this, they aim to establish an intellectual programme on the distinct futures of policy- and identity-making entailed in epigenomic technoscience. This roadmap advances understandings of how the intersection of epigenomics with dominant policy discourses becomes a resource to shape roles and obligations of citizens, patients and health-care actors in the emerging field of personalized medicine.

After epigenetics, two papers address the promises and implications of neuroscience for sociology, but from very different angles. Des Fitzgerald, Nikolas Rose and Ilina Singh (King's College London) in their 'The metropolis and neural life: re-thinking urbanicity and psychiatry in the *Neuropolis*', address the neuroscience of 'urbanicity', that is, the links between neurological development, categories of mental disorder, and the socio-political life of urban citizens. Drawing on the 'urbanicity' literature and the notion of 'Neuropolis', they show how the traffic between social and biological life is being reimagined and re-made, and analyse what is at stake for sociology, in terms of both promise and peril.

John Bone (Aberdeen) in 'The nature of structure: a neurosociological approach?' considers how developments within the neurosciences might be applied to advance sociologists' understanding of social selves and social processes, arguing that this might be a fruitful pursuit despite some residual reservations within the discipline. The paper asserts that overcoming these reservations offers considerable potential, in terms of enhancing our theoretical models and understanding of aspects of the social world. To illustrate this the author explores the potential insights offered by a neurosociological reframing of the foundations of social structure.

Lastly, Lisa Blackman (Goldsmith) in her 'The challenges of new biopsychosocialities: hearing voices, trauma, epigenetics and mediated perception' returns to the promise of epigenetics in the context of what it means to hear voices and attempts to shape a biopsychosocial approach, which can account for the links between voice hearing, trauma and abuse. The paper explores the epistemic spaces and controversies which surround calls for a more psychosocial approach to be incorporated into molecular studies that look at epigenetics. These challenges are posed for sociologists, psychosocial researchers and molecular biologists who in different ways are often trapped by an individual/social dualism or model of interaction effects when theorizing the psychological. In particular, the paper explores evidence from the Hearing Voices Network to draw out the issues at stake for addressing biosocial matters.

Remaining conundrums and future directions

These papers do not aim to exhaust all the possible connections, nuances and problematic nature of the biosocial in this early twenty-first century. The common thread between the contributions seems to be a perception of the extremely rapid changes currently occurring, but also sounds a cautionary note on the risks of generalizing or proposing some sort of ‘direction’ within sociological research. Without the ambition to conclude this introductory piece with a list of recommendations, or any sort of synthesis, we aim simply to enumerate some of the major issues that the increasing relevance biosocial knowledge for sociology and the social sciences is likely to pose. For all this promise and potential of a renewed engagement with the biosocial in the twenty-first century, we believe, a number of challenges, problems or quandaries remain to be addressed.

First, we would like to return to the initial question: *What do sociologists think of when they say the word biology?* In the desire to incorporate biological findings into sociological exploration we can notice a risk to buy *prima facie* biological themes and tropes (from genetics, neuroscience or epigenetics) without much questioning of their plausibility within the life sciences themselves, and the continuing persistence of older deterministic views (see for instance in the case of epigenetics the compelling critique by Waggoner and Uller, 2015). We remain sceptical of this ‘foundationalist’ use of biological knowledge as somehow more valid than other forms of knowledge, as ‘the latest incarnation of longstanding efforts to realize ontological ideals of universality and truth’ for social and political science (Hancock, 2013). Neurosociology, unfortunately, seems to a great extent another example of failing to sufficiently contextualize and problematize the very forms of neuro knowledge production it draws upon (see a critique by Williams, 2011). Genetics also deserves caution. As other scholars have claimed, only a sophisticated theorization of genetic mechanisms and interactions, in the light of sociological insights on how ‘environments’ really work, may contribute to a more nuanced understanding of the role of genetic factors in human behaviour and social interaction, with important implications for their professional and public understanding (Freese and Shostak, 2009).

The lack of a more substantial epistemological awareness of what happens in bioscience also constrains the role of the sociologist to mere interpretation or speculation. Without the possibility of a real biological and epistemic critique, this becomes a corner where the social scientist or the humanist are confined (Stotz and Griffiths, 2008). Here insights from science and technology studies are important in questioning both the substantive ‘facts’ of biology and their underpinning epistemology. This approach is also important in keeping open a distinction between *scientific claims as already made* and *scientific claims in the making* (see for a similar critique of the so-called new materialisms, Paxson and Helmreich, 2014).

Second, and very significantly for a *Sociological Review* monograph of this nature, is the problem of where precisely this leaves *sociology* as a disciplinary practice, project or pursuit. Views of course, as reflected in the monograph, will

differ on this critical question, with some calling for or defending the need for a 'disciplined' sociological engagement of some kind (see also O'Reilly, 2009) and others, as previously noted, questioning the very 'regime' of the 'inter [disciplinarity]' as itself a part of the problem (as in Fitzgerald and Callard, 2015). Debates of this kind are likely to intensify in coming decades, as another vital strand of more general millennial musing on the state and future of the discipline, is surely beyond dispute. However, the 'biosocial', we suggest, will be one of the most critical of these fault lines for sociology in the coming decades.

A third closely related set of ongoing problems here concerns *methodological* issues which are not simply related to the types of theories and concepts at stake in such biosocial ventures, but whether or not this involves a commitment to more *causal* or *explanatory* modes of inquiry. These might include more experimental designs and the use of innovative new biosocial methods, including the routine collection of biosocial data within sociological research, for example, through the use of digital apps and smart devices.² The development of new biosocial research tools and methods is already underway and it is vital that sociologists critically engage with this new domain of knowledge production to ensure old certainties about the relationship between biological and sociological knowledge are not reproduced anew.

Fourth, to offer a sociologically-aware view of the *epistemic* shift toward the biosocial it is also important to note how research funding and research council priorities are now shifting in this more biosocial direction through cross-council collaborations and initiatives. In the British context where this monograph has originally arisen, various ESRC programmes amply demonstrate this trend, and include the recent ESRC/BBSRC call on epigenetics and others on biosocial methods. These new methods are still under development and the emerging relationship between different epistemic domains is still being negotiated. However, it would appear that this is motivated by a genuine appetite for new ways of studying biological systems in social context.

This in turn brings us to a fifth key problem ahead on this biosocial frontier, namely, the role of the biosocial as a form of *governance* and, in a *reflexive* vein, the role of sociology and the social sciences within such a governance regime. Amongst the many problematic aspects, we might mention the recent return to claims of soft heredity, via epigenetics in public policy and public health. What will be the implications and political usages of claims that certain specific social groups, because of their long-term exposure to pathogenic environments, are biologically different or even damaged and can transmit their scars to future generations? Will contingent and often transient biological differences, as different levels of epigenetic methylation, be reified as markers for class and race differences? The debate on race in the postgenomic era (Duster, 2015 and comments in a *British Journal of Sociology* recent Special Issue) has to be extended to this novel epigenetic view of genetic functioning. This implies a significant shift from previous concerns with biologicistic views of race as mirroring underlying stable genetic mechanisms. On the contrary, here race, in developmental and epigenetic view, becomes the processual outcome of embodying certain historical

experiences, 'a socially constructed category that has biological implications' (Kuzawa and Sweet, 2009: 4). This is not to say that with this view, all political concerns are put to rest, quite the opposite (Meloni, 2016). But the language of critique needs to intercept the genuine discontinuities of the postgenomic phase.

Moving from race to class, social historians like Michael Katz have warned that we must pay attention to the present resurgence of biological definitions of the poor (2013) fearing a return to a biologically based class racism, what he calls 'The Biological Inferiority of the Undeserving Poor'. As sociologists we find it troubling that so far biosocial studies have been concerned mostly with poor or disadvantaged social groups, and that for instance the vocabulary of environmental epigenetics is filled with studies of 'traumas', 'stress', 'stressors', 'deprivation', 'toxic exposures', 'social insults', 'adversities', 'scars', 'wounds', 'deprivation' and 'early adversity'. Is some or even much of the discourse of the biosocial part of a new form of governmentality of the poor? A recent title of an article in *Nature* 'Poverty shrinks brains from birth' (Reardon, 2015), albeit written with a compassionate attitude, raises troubling questions about the future direction that biosocial research may take in social policy and public health. As sociologists we surely should problematize this wave of studies, and ask back too perhaps: why not a biosocial study of how the effects of working as a Wall Street CEO and the culture of greed that is associated to it modifies brain architecture, emotion and behaviour? Which assumptions about normality and abnormality, which social values and beliefs, lie behind the research design of many biosocial studies at present (see also Guthman and Mansfield, 2013; Meloni, 2016)?

Finally, each of these foregoing issues is intimately and inextricably bound up not simply with debates about *what it is to be human*, but also the role of sociology and the social sciences in the very project of humanity. One of the key dimensions of the biosocial reconstruction of the human is with respect to ideas of sociality and, as a consequence, the central focus of the social sciences. A new figure of the human is emerging within these complex biosocial narratives that is grounded in the authority of biology. For example, recent studies in primatology claim to reveal the innately pro-social nature of humans, which provides a counterpoint to previous ideas of selfishness as the evolutionary basis of social interaction (de Waal, 1996, 2006, 2009; Meloni, 2013). Other biological concepts inform new fields such as neuro- and behavioural economics and the psychology of empathy (Young, 2012; see also for the general framework Greene and Haidt, 2002; Greene, 2003; Haidt, 2001, 2007; Moll *et al.*, 2008a, 2008b). They are seductive as they chime with many existing ideas within the social sciences / sociology and are therefore more easily integrated than biological determinism, but there still remains a powerful evolutionary logic underpinning much of this work. The extent to which the biological sciences can provide a new foundation for the social sciences in understanding the human is therefore a critical question, both now and for the foreseeable future and these underlying assumptions need to be excavated if not interrogated and understood. So not only does sociology face threats to its epistemic authority, but it is having to deal with new conceptions that lie at the heart of its historical concerns with the human and

the social. The emerging epistemic domain of the biosocial therefore represents both the promise of *renewal* for sociology as a discipline and a serious challenge to some of its most entrenched assumptions.

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Notes

- 1 Equally powerful have been Paul Rabinow's concept of 'biosociality' (Rabinow, 1996) originally framed to define the production of new forms of identities resulting from claims in biomedicine and genetics; and Sarah Franklin's work on genetics and kinship (2003; see also Franklin *et al.*, 2000), expanding on the contribution of anthropologists such as Marilyn Strathern and Haraway. See also importantly Rapp (1999). Hans-Jorg Rheinberger's work on the embedding of genetics into the social fabric is also significant to mention in this context as a precursor of current biosocial views (see for instance for his methodology, Rheinberger, 2010).
- 2 To achieve this new collaborative working relationships will have to be forged with scholars from a range of biological, medical and psychological fields. As the editors of the 2008 special issue of the *American Journal of Sociology* on 'Genetics and Social Structures' noted, 'the beauty of sociology as a discipline rests in its hybridity with respect to method and data' so much so that 'It is possible, for example, to arrive at sociological insight even from the application of behavioral genetics methods' (Bearman *et al.*, 2008).

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